Version 1.2 E - USA

Technical Manual

Automatic

Washer / Disinfector

WD 240

BELIMED®
INTERNATIONAL

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The Operations Manual is a separate document and must be available to the user.

Additional documents

- Declaration of Conformity
- Maintenance Log

Edition	Applicable for machines No.	(400 V 50 Hz E[1])	99880
		(208 V 60 Hz D[2])	99881
Rev. 1.1 E / Pf	Feb. 1998	From serial No.	998808F001
			998818F001
Rev. 1.2 E / Pf	Aug. 1998	From serial No.	99880I011
			998818I011
Rev. 1.2 E – 5	Sept. 2000	(Modified for use in the United States)	

[1] Electric heat, wash chamber

[2] Steam heat, wash chamber

1. Installation

1.1 System Components

1.1.1 Wash System

Dynamic Washing Method

On startup, the control system admits only as much water as is needed for proper operation of the circulation pump. Depending on application rack or machine loading, an adequate additional quantity of water is introduced. This method assures optimal cleaning performance while conserving the use of water and chemicals.

Wide Range of Machine Application

The machine is equipped with a powerful circulation pump of 750 liters / minute at 7.5 psig pumping capacity. The extremely flat characteristic line of this device ensures maximum quantity of water on wash goods, thus assuring best possible cleaning results.

Docking

A cylindrical bushing on the machine rack docking point is being pressed against the wash rack by water pressure. This bushing is designed to make for a perfect connection, insuring best possible water flow to the rack. By means of a retaining spring, the bushing will reset to standby position upon pressure loss (e.g. end of program or malfunction).

1.1.2 Control System

The machine is equipped with a programmable logic controller (PLC). By keyboard entry, selection of six pre-defined programs are available.

Another fine feature is the self-diagnostic test routines. Automatic tests are performed regularly. This is an early warning system for potential machine problems. Respective input signals are permanently monitored, deviations beyond preset tolerances cause acoustic alerts and are indicated on display.

External Printer (optional)

Following information may be recorded by an external printer:

1 Test report

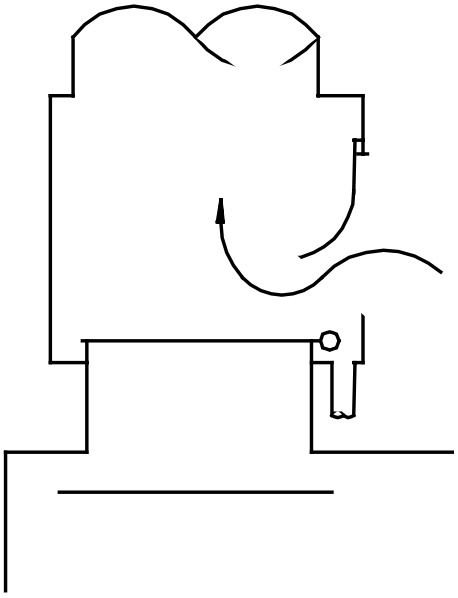
2 Error codes with indication of machine status

3 Program printout of actual readings

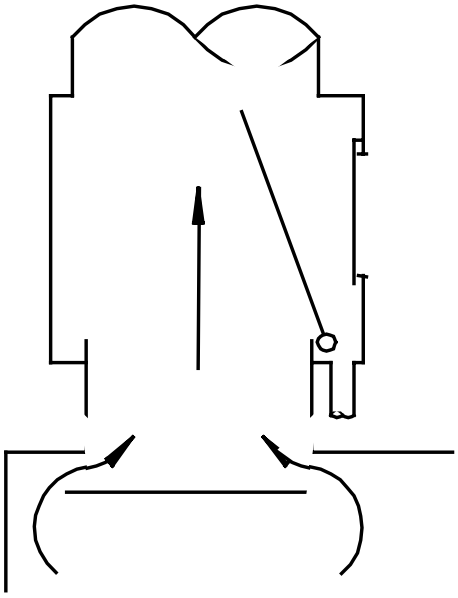
1.1.3 Exhaust Damper

An exhaust damper with a condensate trap is delivered along with the machine. During the washing phase the damper closes the chamber exhaust exit thus reduces heat loss when operating at high temperature levels. During the drying phase the damper opens to allow for proper exhaust.

Washing



Drying



1.1.4 Malfunction Control

Safety Features of Control System

In case of over or undershooting important parameters, the control system initiates a shut down of the active program cycle.

Following parameter considerations will cause machine shut down:

- Overshooting safe water level (lower door opening, P1=2.5 V when pump is not in operation, 3.1 V when operating).
- Undershooting of min. water level (Tank heating elements are not immersed in water).
- Lack of water input (water flow interrupted if within 5 minutes a level difference with a reading difference of at least 0.1 V isn't observed)
- Drain blocked.
- Preset water temperature is not reached.
- Control system does not detect any change in water temperature (heater failure, reading of temperature sensor must increase by at least 1 °C within 5 minutes).
- Doors are not closing within preset time period (16 seconds).
- Either temperature sensor or level sensor is defective.

Options:

- Leakage detector in floor pan.
- Monitoring dosing of additives by flow meter.
- Various positioning preset indications for automatic rack drive system.

Safety Features other than in Control System

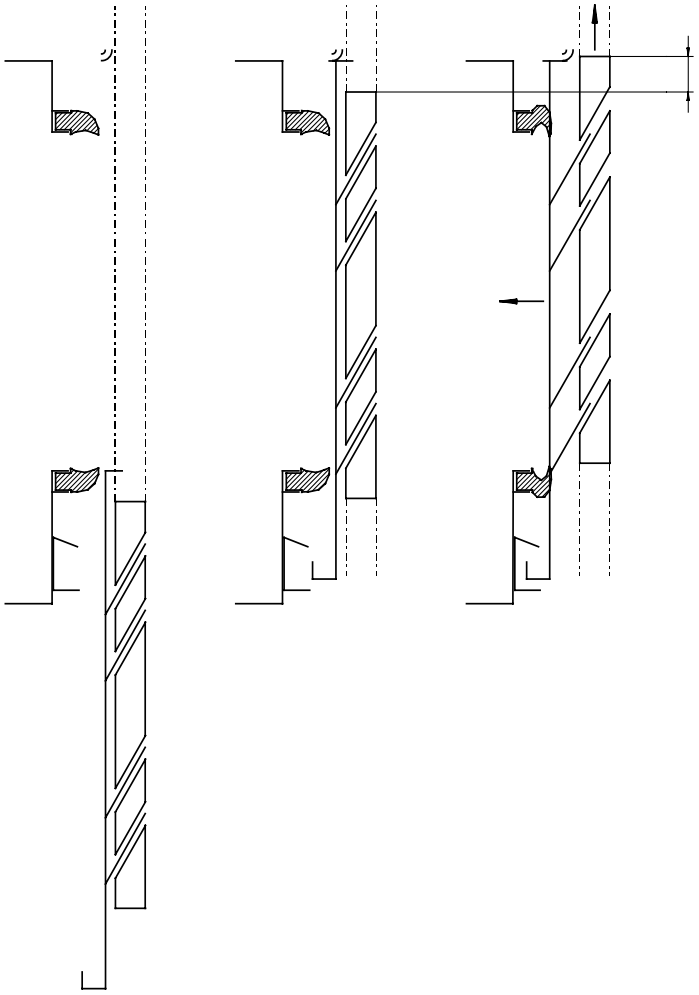
Temperature limiters are designed to interrupt respective power circuit to protect machine and wash goods from overheating.

Should water level rise above door's edge, drain will open automatically by means of a pressure switch (S29). The pressure switch is activated by means of a second inverted chamber in the water tank. The chamber is used to convert depth of water into air pressure. S29 and it's connecting hoses are not part of the fluid path ways. This is also done for pressure sensor P1.

1.1.5 Door System

The automatic door closes from bottom to top. It is guided by a toothed belt (timing belt) on each side. The wash chamber closure consists of an inner and an outer door. The outer door presses the inner door against the wash chamber door seal. The pressure level of the doors is controlled by height adjustment of the upper limit switches of the door. The higher the switch is set, the higher the pressure of the inner door against the door seal.

As long as objects are in the closure range of the door, a safety strip switch on upper door edge prevents door closure. The machine shut-off is controlled by an evaluation of electrical resistance, the trip value is 8.3 Ohm.



1.1.6 Single Door Wall Mount

The machine may be installed in wall mount fashion, provided the plug of the door switch of the clean side is first removed.

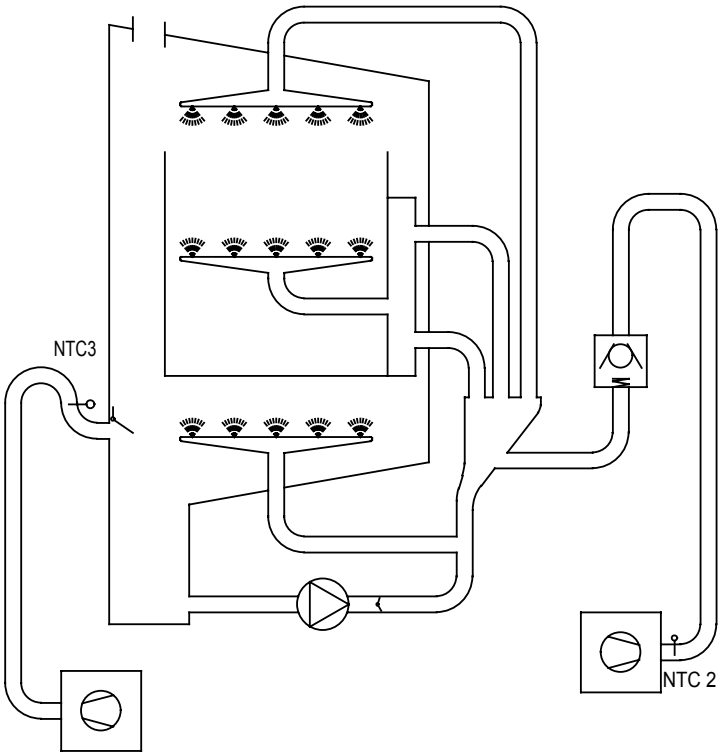
1.1.7 Dosing of Cleaning and Lubricating Agents

Dosing of additives is controlled by flow metering. Additives are precisely metered in proportion to the actual water input quantity.

Additives are channeled through suction tubes (installed in original additives container) by peristaltic pumps. These pumps propel agents directly into the wash chamber. The level in the storage containers is monitored electronically.

Option: Dosing system may be post-equipped with independent flow meters, thus permitting recording of actual additives consumption.

1.1.8 Dryer



The Automatic Washing and Disinfecting Machine has two independently operating drying units as standard equipment. Hot dryer air is delivered through the water line and jet system on the one hand and by means of direct input into the wash chamber on the other. This separation makes for a very rapid and careful drying of the wash goods. Intake air is guided through an absolute filter of 3 µm. Reduction of drying time can be achieved by programming of higher dryer temperature. Hereby, the air flow volume is of secondary importance.

During the first 5 minutes, even with thermally unstable wash goods, the available max. temperature of 90°C may be applied without risk. For the second phase, temperature may be reduced to desired level. There is no need to program a shut-off. During the final 20 seconds the blower will automatically operate with no heating.

.

1.1.9 Materials

Strict use of high quality materials is guarantee for long life and reliability of these machines even under tough operating conditions. Whenever materials other than stainless steel, namely synthetic materials were used, they were selected to be resistant to chemicals and high temperatures. For reasons of hygiene, the wash chamber and the entire outer shell of these machines are made of finely polished stainless steel (CrNi 18/8 steel).

1.1.10 Insulating Materials

The wash chamber and all water carrying parts are completely thermo-insulated. Special noise reducing and sound absorbing mats are designed to minimize noise emission.

Thermal bridges that may carry energy from the wash chamber to the outer body of the machine have been minimized by design. Energy radiation and convection losses have thus been significantly reduced.

1.2 Hygienic Operating Safety

1.2.1 Wash Chamber

All water carrying parts possible were made of CNS stainless steel. One of our design priorities has been to keep water conduits as short as possible and to avoid tight radial corners. This design principle reduces the water carryover from one step to the next.

1.2.2 No Cross Contamination

Proper drain valve location assures complete wash chamber drainage of the machine. All water carrying components are designed with a slope (e.g. wash chamber ceiling) angled enough to facilitate complete drainage of water after operation of the pump has ceased.

1.3 Options

1.3.1 Base /Floor Pan 50 mm

The machine base, e.g. the floor pan are welded tightly and must be ordered separately. Each pan is drained separately

Important note

Simultaneously, base and docking rack must be elevated to 920 mm by means of an adapter.

1 x base 900 x 50 mm, module A	820477
2 x base 1000 x 50 mm, module B	820478
Docking rack	
Set docking rack height 920 mm	820483

1.3.2 Automatic Rack Drive

When using automatic rack drive, following articles must be ordered separately:

Rack drive set 60 Hz	820425
Rack coding (on machine)	820413
Rack coding (for each rack)	820414
Additional interface print	76006

1.3.3 Drain Water Cooling

In certain countries, the allowed max. temperature is limited. Per available option, CW (cold water) may be added automatically. Thus, the drain water temperature will be limited to 60°C. (Y38 CW valve for cooling water as of 60°C)

1.3.4 Leak Indicator

By means of the option Leak Indicator, any potential loss of wash liquid into the floor pan may be indicated. (S38)

1.3.5 Fourth Dosing Pump

As a new feature, a fourth dosing pump may be connected.

Dosing pump set 60 Hz:	820 356

The dosing accuracy will increase significantly by application of flow meters.

Flow meter	820 581 (one flow meter for each pump)

1.3.6 Multiple Dosing Empty Indication

When dosing of additives is applied from a central storage container for distribution to several machines, a special option ‚Multiple Dosing Empty Indication' will be required (part No. 820 459). With this option, up to six machines may be supplied with dosing agent from one and the same container. All machines may be connected to *one* empty indicator.

Caution: More than six machines may not be connected to this option !

1.4 Technical Data

General	Energy radiation loss, free standing	850 (+/- 200)	W
	Machine weight with side covers	265	kg
	Noise level with side covers	<63	dB(A)
	Maximum operating altitude	1700	meters
Door	Opening from top to bottom	automatic	
	With safety shut-off	safety strip	
Material	CNS	1.4301	
	Pump impeller	CNS	
Dimensions	Width	900	mm
	Depth	750	mm
	Height	1750	mm
	Chamber, useable depth	600	mm
	Chamber, useable width	600	mm
	Chamber, useable height	600	mm
Power Data	Wash chamber heat, electric	15	kW
	Wash chamber heat, steam	ca. 38	kW
		33 000	kcal/h
	Steam power at 3 bar	66	kg / h
	Wash pump, capacity	750 @ .5 bar	l/min
	Wash pump, rating	1100	W
		1.5	HP
	Drain valve ND 50	17	W
	Dryer heater, air	7	kW
	Blower dryer, rating	2	kW
	Exhaust air volume, dryer	300	m^3/h
	Exhaust air volume, wash cycle	5	m^3/h
Dosing Pumps	Standard model	3.	pcs.
	Optional	1	pcs.
	Flow meter	Optional	
Filter Data	Type	HEPA	
	Filter class	EU 14 / U 14	
	Efficiency	99,99% at particle Size >0,3µm	

1.5 Connections

1.5.1 Plumbing

Cold Water	Connection (supplied by user)	3/4 inch	MPT
	Water pressure	200 - 500	kPa
	Flow rate, app.	40*	l/min
	*at water pressure	2.2	bar
Warm Water	Connection (supplied by user)	3/4 inch	MPT
	Water pressure	200 - 500	kPa
	Flow rate, app.	40	l/min
	Temperature, app.	50	°C
	Suggested hardness	<70 ppm	CaCO3
DI Water	Connection (supplied by user)	3/4 inch	MPT
	Water pressure	200 - 500	kPa
	Flow rate, app.	40	l/min
	Suggested conductivity	< 30	µS/cm
Drain	Connector set EPDM i/d.	60 mm	
	Temperature, max.	80	°C
	pH-value	5-9	pH

1.5.2 Steam

Connection	Supplied by user	3/4 inch	MPT
	Standard pressure range	150 - 300	kPa
	Max. pressure	400	kPa
	App. steam temperature	130°	C
	Saturated steam		

1.5.3 Exhaust

Connection	On machine: pipe OD/ID	115 / 109	mm
	Exhaust volume, dryer	300	m^3/h

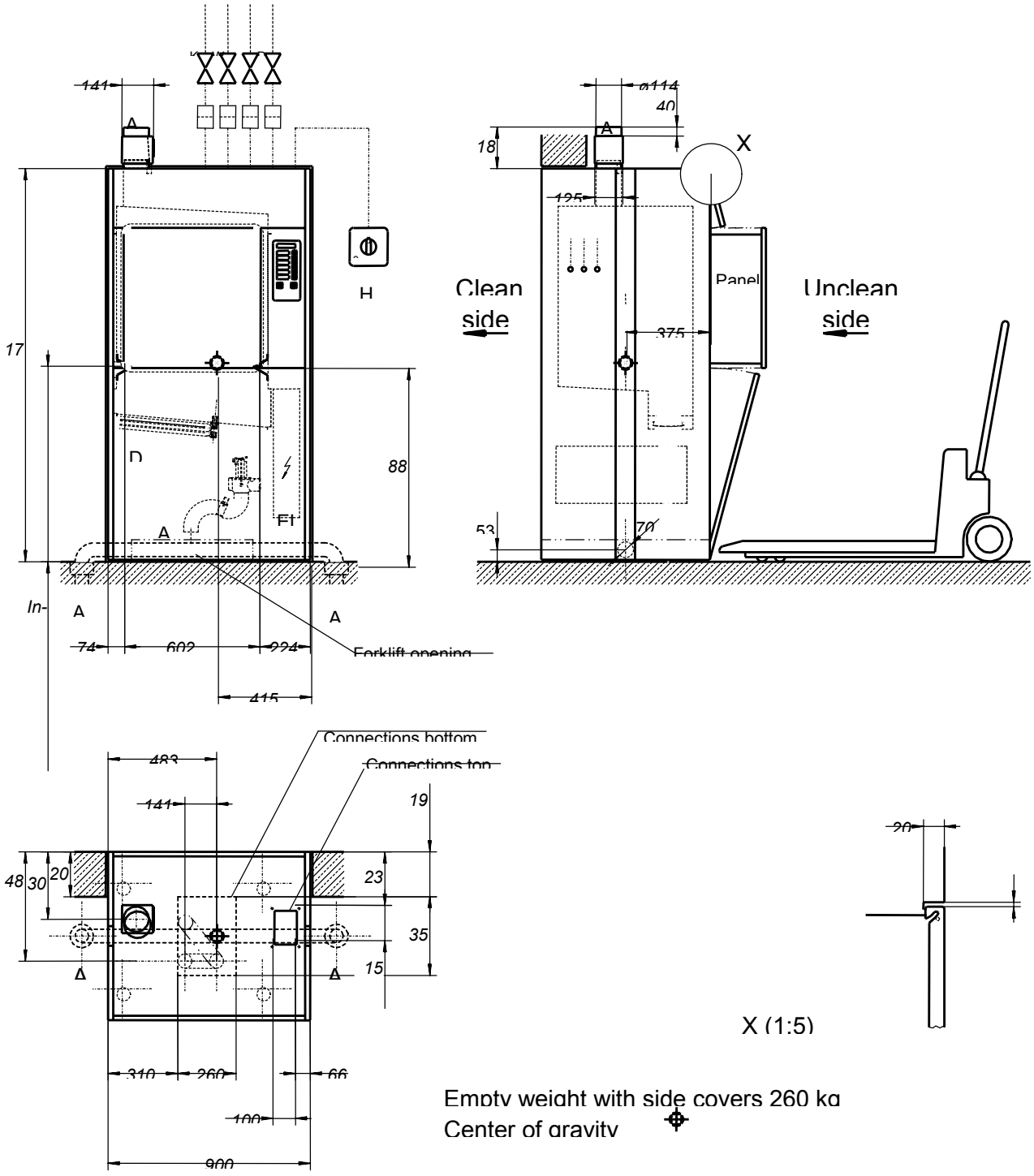
1.5.4 Connected Load

3 ph 60 Hz	Service 3 AC	208	V
	Fusing	50	Amp
	Total connected load	15.3	kW
	Water heater	Electric	
3 ph 60 Hz	Service 3 AC	208	V
	Fusing	30	Amp
	Total connected load	8.1	kW
	Water heater	Steam	
3 ph 60 Hz	Service 3 AC	460	V
	Fusing	20	Amp
	Total connected load	8.1	kW
	Water heater	Steam	

1.6 Wiring Diagram

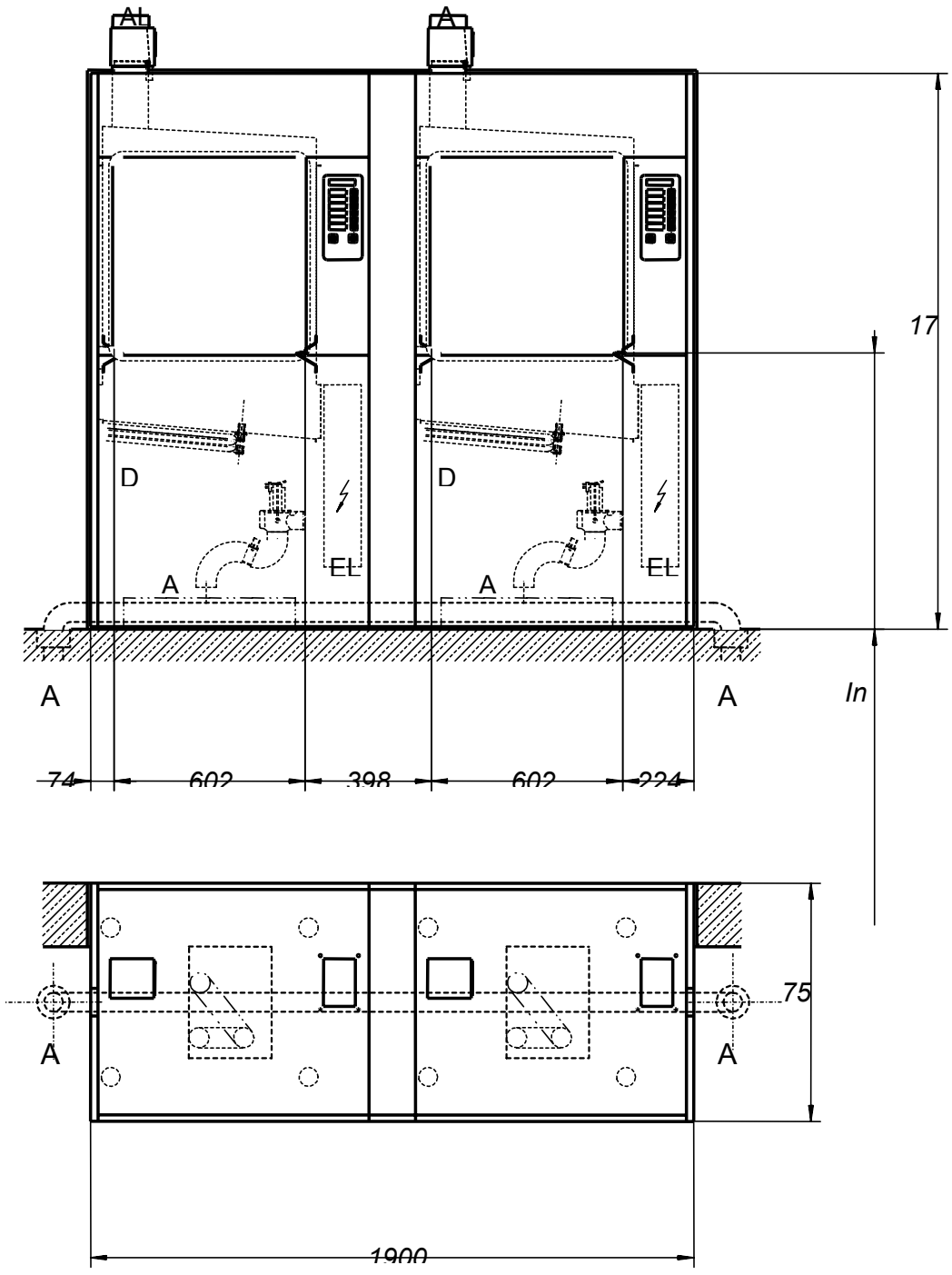
1.6.1 Free standing

Pic. 74170-0



1.6.2 Side-by-Side

Pic. 74170-0



1.7 Connections

Required on Building Site	Included on Machine with shipment
CW, WW, DI Water Connections	
Shut-off valve 3/4"	2.1 m Wire mesh armored hose
CW = Cold water	Fine filter 3/4" mesh gauge 250µ
WW = Warm water	Free flow section
DC Drain	
Floor drain w/siphon Drain stub o/d 60 mm	T-connector for Condensate Drain CD = o/d 28 mm
Lateral drainage possible	siphon drain hose i.d. 60 mm
AE Air Exhaust	
Exhaust duct o/d 115 mm insulated	Exhaust duct o.d. 114 mm, i.d. 109 mm
	Condensate collector with drain
	Exhaust flap with induction opening
EC Electric Connection	
All pole main switch	Cable 60 Hz 4x4 mm ^{2} L = 3 m with
per EN 60204 with min. contact separation 3 mm	protective sleeve G16 L = 1.3 m
Separate safety conductor	or larger as required by state & local codes
SC Steam Connection	2 T-elements ½"
2 Shut-off valves ½"	1 Magnetic valve ½" (24 VAC)
1 Waste separator ½" (100 mesh)	2 Couplers ½"
	2 Condensate separators ½"

General Conditions ref. Connections:

On building side, check all required supply and drain connections per respect. drawing.

CW *Plumbing connections:* The installation must be carried out by locally licensed personnel. Such installation must conform with all local, professional codes. Connection may be made from top or from bottom. In case of installation from the floor, it is imperative to use the lower connection opening of the machine. Max. protrusion of shut-off valves above floor is 100 mm.

If DI water is supplied without pressure, then an appropriate pressure augmenting pump must be installed.

DC *Drain Connection:* Included in machine shipment is a siphon drain hose. If several machines are to be installed side-by-side, the drains of all machines may be combined into one floor drain (R 2”). For such purpose, an opening in the side of the machines is provided (d = 74.5 mm).

AE *Air Exhaust:* Machine is being delivered including an air exhaust flap with condensate collector. If exhaust air duct length exceeds 6 m or if air back pressure exceeds 150 Pa, an exhaust blower must be provided (e.g. WESCO).

MS *Main Switch:* Electrical connection is made by means of a connecting cable. On building side, overload protection is to be provided (see rating tag), a main switch and a ground fault switch (suitable for AC ground fault protection as well as for pulsed DC ground fault protection). In case of permanent installations, machine chassis must be mutually connected (potential equalizing connecting point is marked).

SC *Steam Connection*: Connection to building steam line must be made according to local building codes. Preferably, the condensate return is to be made by way of floor connection. It is imperative to provide a waste trap in steam line (building side). On machine, a magnetic valve (Lucifer-Skinner, type 7321KBG4TEWO), normally closed, R ½, is included in our delivery. Installation position is not important, (preferred position of magnet system is upright). Voltage 24 V, 50/60 Hz.

Suction line for dosing agents: Max. length for suction line (dosing agents) = 10 m.

Special hose throughputs are provided in base of machine.

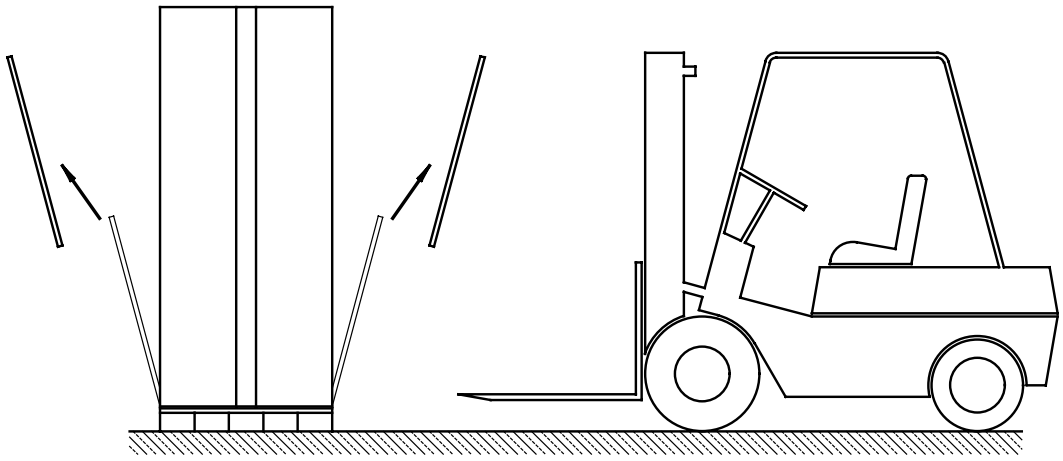
There is no need for a compressed air connection.

1.8 Shipping and Installation of Machine

1.8.1 Transport

Machine must be moved in upright position. Basic model is delivered without side enclosure. Depending on installation method, respective side cover components may be included.

Pic. 74170 - 0



For the removal of machine from pallet, an opening is provided on lower front side.

Important Notes

- In order to use this opening, the lower front cover as well as the *rear* covers must be removed, otherwise the rear cover may be damaged. Forks of forklift may be cautiously inserted in this opening. This is the only point on which the machine may be lifted!
- Machine may be tilted toward front or rear edge.
- If machine is to be lifted off the pallet without the assistance of a forklift, the adjustable feet must be fully retracted.
- To open machine door with power off, drive motor and its bracket may be loosened and moved laterally. Caution: there is no door safety! And door will drop.

1.8.2 Installation

The exhaust air flap is slipped over the exhaust duct and the condensate hose is to be connected.

Caution

In case a front cover is to be installed above machine, then it is imperative to maintain a gap to upper edge of 3.2 mm (see detail X in connection drawing). The machine lid must not be removed. Support of additional enclosures is preferably done by way of suspension from ceiling structure.

In case of multiple machine group installation, only space covers are installed. Distance between each two machines is 100 mm. A spacer panel (part of the space cover set) insures proper machine separation. Side and space covers may be installed from front side.

Important Notes:

- Lifting of machine by its cover (lid) is prohibited.
- The spring loaded ball snaps (holding front enclosure) are to be adjusted first. Once side covers are installed, access to adjust ball snaps is no longer possible.
- Check circulation pump for proper rotation direction.

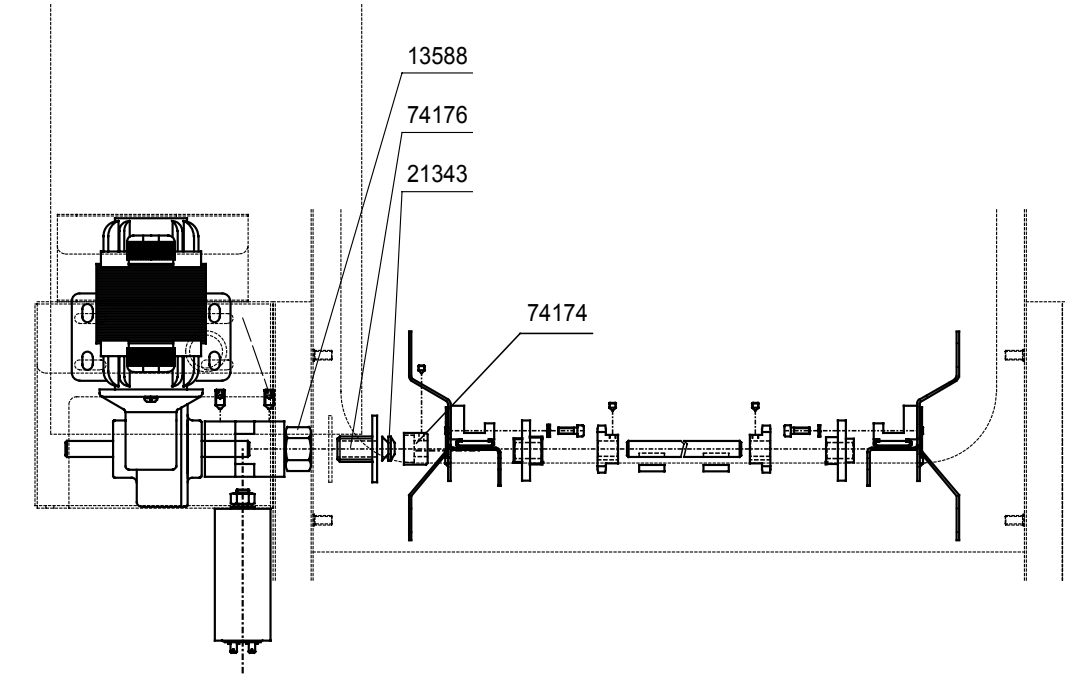
1.8.3 Installation of powered Rack Drive

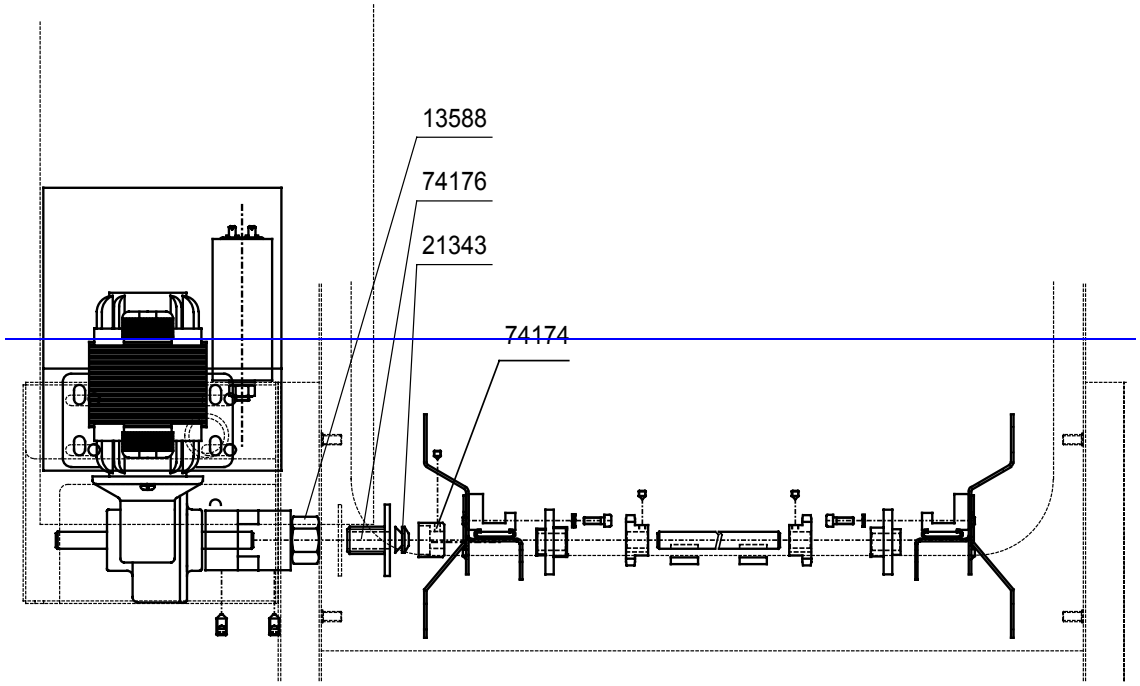
During installation of rack rails, be sure that docking points of machine and those of racks match.

Installation of components must be made according to following sequence:

1. Align rack rails with rack docking. The rack docking device must be exactly aligned with rack docking counterpart on machine.
2. Fasten rack rails to rack (with drive shaft).
3. Fasten nut at throughput of drive shaft (13588) to wash chamber. The bushing with respective shoulder (74176) must not be in contact with drive shaft.
4. Cautiously press seal (21343) on drive shaft against shoulder. Then, slip seal cover (74174) against shoulder and tighten.
5. Tighten chain tensioner (74161)
6. Adjust height of drive motor to that of drive shaft and tighten.
7. Check and make sure that air damper at dryer air inlet can be opened.

Pic. 74247





be installed above existing buttons.

The dosing hoses are to be installed similar to existing ones, between pumps and wash chamber access; use clamps included with set.

Dosing pumps M 23 and M 24, as well as push buttons (for direct pump control) are to be connected with the pre-existing plugs in the cable tree, see chapter 5 and wiring diagram.

Connect suction hose with dosing agents container.

Dosing pumps may be controlled directly, either by code switch on position 4 of processor print, interface 2, (depending on dosing pumps) by the respective relay REL 1, 2, 3, 4, or by the white push buttons. Push button until dosing agent is flowing into chamber.

1.8.4 Installation of additional Dosing Pumps

Standard equipment includes three (60 Hz) quantity-controlled dosing pumps. Optional, one additional dosing pumps may be installed.

Additional dosing pump can be are installed on dosing pump shelf, next to electro drawer. Push buttons are below the wash chamber.

1.8.5 Installation of Empty Indicators

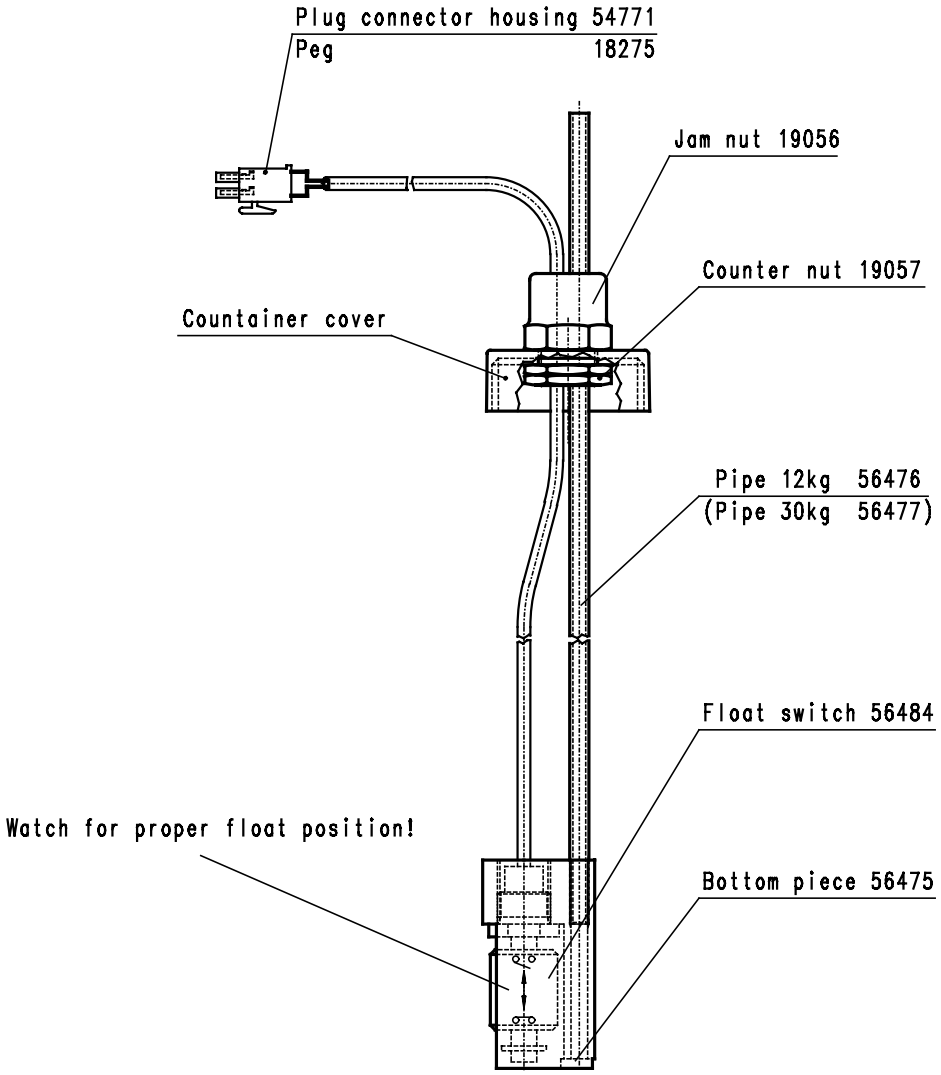
The empty indicators are assembled as per graph below:

Container lid or cover must be pierced (by customer) with a 21 mm diameter hole.

Use caution when handling cleaning and disinfecting agents:

Eyes, hands and clothing must be protected. Wear gloves when handling agents, -

do not ingest, - avoid contact of agents with eyes and skin.



Pic. 56486

Connection terminals for empty indicators are found in upper electro drawer, on unclean side.

Attention: It is not allowed to connect more than one machine with one and the same empty indicator!

Multiple Dosing Agent Empty Indicator

In case dosing agent for several machines is to be supplied from one central container, use optional ”Multi-Dosing Empty Indicator”. With this option, up to six machines may be supplied with dosing agent from one container. All machines may be connected with one empty indicator.

It is suggested to install a one way valve at dosing pumps to prevent back flow.

1.8.6 Installation of Rack Coding (optional)

This option permits receiving racks to be permanently assigned to one given wash program. The operating personnel can thus not interfere with such fixed assignments. The machine, as well as the receiving racks are designed to accept this option.

Installation on Machine

Four holes are available in side of wash chamber for the installation of the reading heads.

Connection of reading heads is to be made according to wiring diagram (see chapter 5, p. 16, p. 17 and p. 18). Connection is made on clean side.

Installation on Rack Side

Mounting holes for the coding angle bracket for magnets are found in vertical orientation on the water channel. Magnets are fastened on coding angle bracket by means of flat head bolts M4 x 8 and are secured by lock nuts.

Magnets are to be installed according to instruction sheet (included with installation set).

1.9 Operation Start-up

Before operation start-up, all plug connections and all hose connections must be checked for proper setting. Check list:

a) Check levels in cleaning and disinfecting containers and connect them properly with machine.

b) Open electro drawer.

c) Open shut-off valves and turn main power switch on.

d) Press on - off button.

e) Individual user control - Set code switch on processor print on position 6 (see chapter 3, Code Switch on Processor Print). Then briefly turn on the individual outputs for a function check. Power supply to interface 1 is designed to be controlled by upper door limit switch. In case of open door, switch may be actuated manually.

CAUTION: Dryer heater must only be operated in conjunction with blower.

f) Temperature calibration - Using code switch position 6, fill chamber to bottom of lower wash arm with water. Heat water with steam/electric until almost boiling. Change to code switch position 3 and observe temperature t1 (tank temp.). Place a calibrated temperature probe within 1 inch of units temperature sensor and observe difference. Unit should read the same or 1 degree C lower. If not go to code switch position 9 and adjust. Note, if temperature drops below 90 degrees C then repeat test.

g) Set code switch A to position B and check (or adjust) the desired programs. (Instruction per chapter 3).

h) Following this check, return switch to position 0 (normal operation).

Door Adjustment:

During operation, water must not run into collection trough underneath door. If this happens, door is not sealed tightly, proceed as follows:

- Push lower chamber wall at door cut-out to outside.
- Space between door seal and inner door is uneven. Loosen door guides on side and re-adjust.
- Slide upper door limit switch upward. Caution: the limit switches must not be moved upward to far at one time. The tilt moment of the door motor must not be exceeded when opening door, otherwise door will jam.

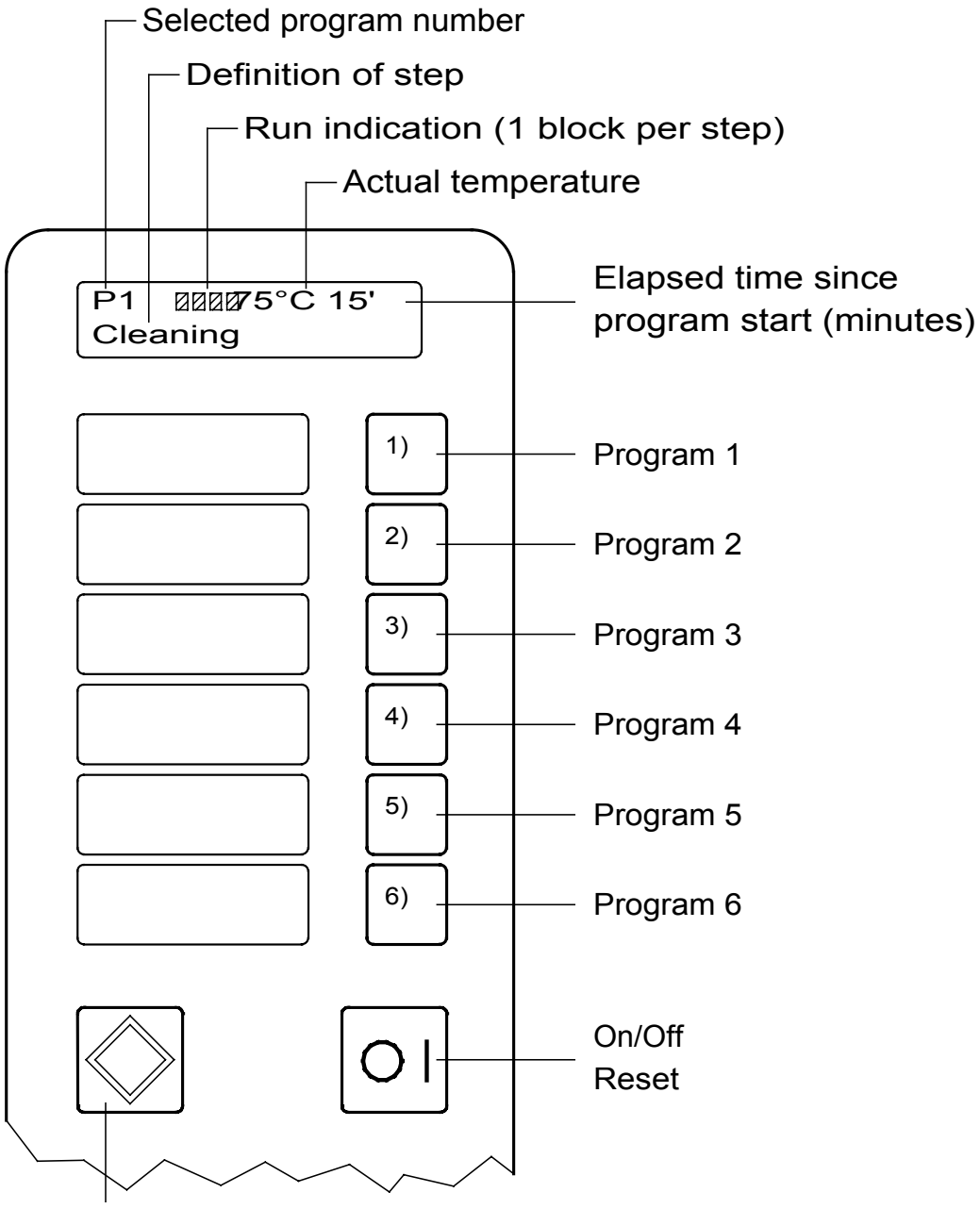
Important Notes:

- Check rotation direction of wash pump.
- Individual control can only be exercised if both upper door switches are closed.
- Make sure that inner door always closes completely (also when using high operating temperatures). Inner door must not touch the seal as it opens.
- Verify that both dryers are operating. By software design, there is a gap of 30% between targeted temperature (program input) and the temperature sensor value (T2 only).
- Verify that a waste separator is installed both in steam, as well as in water lines.
- Verify exact match of docking points on machine and on rack side.
- On racks of previous model (SM 1000), uppermost docking feature must be closed. (Updating kit SM 1000 to WD240, consisting of two parts)
- Use of basic rack of previous model (SM 1000) on which the upper docking openings are not blocked, is not allowed.
- Verify that air intake dampers below rack rails may, indeed, be opened.
- If tilt moment of door motors has been exceeded and door can no longer be opened, manually push door upward. This will take load off the worm gear, and door can be opened.

2. Operating Instructions

2.1 Touch Control Membrane

Pic. 77218-17



2.2 Program Start and Run

1. Verify proper level in wash additives containers. Refill if required.
2. **Important notice about the application of cleaning and disinfecting agents:**
3. Protect eyes, hands and clothing. Wear gloves to handle additives, do not ingest, avoid contact with eyes and skin.
4. Open shut-off valves and turn on power.
5. Push 0-I button.
6. Push door button to wash chamber, remove rack.
7. Load rack with wash goods, then return rack to wash chamber.
8. Machine is now ready for operation.
9. Select the desired program by pushing respective selector button. Program status is now being displayed.
10. During program run, display always shows current cycle step, current temperature in wash chamber and elapsed cycle time.
11. The wash chamber door remains locked during entire wash cycle.
12. At end of program, open door by pushing door button and remove wash goods .
13. Door of clean side can only be opened at end of program.

Important Note

- With power off, wash chamber cannot be opened.
- Only **one** door at a time can be opened.
- To open the door of the clean side without running a program, proceed as follows:
    1. Turn off main switch on building side (supply service off).
    2. Turn on main switch on building side
    3. Press I / O switch
    4. Operate door switch of clean side

  The entire disinfecting program may not be interrupted at any time and for any reason. Following each interruption, the program must be reset and started again from the beginning.
- Should machine remain idle for more than two days, a disinfecting cycle (i.e. Instruments Normal) may be run. This will also bring utilities up to functionality.

2.3 After Use

1. Close water valves
2. Turn off main switch on building side, (supply service off).

2.4 Empty Indication

D	O	S	I	N	G		A	G	E	N	T		E	M	P	T	Y						
1		2		3		4		5															

Cause:

Dosing agent supply in container x is at zero or empty indicator float is defective or improperly installed; maybe terminal wiring is faulty.

Remedy:

Refill dosing agent, check float contact, check for proper wiring of connections on front side of electro box.

Note:

A safe disinfecting and cleaning is only guaranteed if there is ample supply of all additives.

When handling chemicals: protect eyes, hands and clothing. Always wear gloves, do not ingest agents. Avoid contact with eyes and skin.

2.5 Malfunction of Machine

2.5.1 Machine will not run (check list):

1. Is main switch on?
2. Are fuses OK?
3. Is machine door properly closed?
4. Check for error codes on machine display!

2.5.2 Machine does not wash cleanly (check list):

1. Are all water valves open?
2. Is there sufficient supply of cleaning and disinfecting agents in containers?
3. Are dosing tubes clean and permeable?
4. Are the primary and secondary screens clogged?
5. Are jets in wash arms clogged?
6. Are docking devices operating properly?
7. Are jets in rack clogged?
8. Has the correct program been chosen?

In case you wish to contact your machine service center, be sure you have the following information handy when you call:

- Machine serial number (see machine tag).
- Exact commands given prior to failure (e.g. program data or names), and
- Which error codes you have found on display when machine failed to operate properly.

2.6 Control System Messages and Error Codes

Definition of terms

CS Clean Side

US Unclean Side, also known as DS for Dirty Side, or Decontam Side

Codes	Description
099	Control system does not recognize any machine coding. Plug X13 is not inserted, call for service.
100	Door contact of door US has opened during an active program; door not closed; door switch US defective.
101	Time elapsed to open door US has exceeded 15 min.
102	Time elapsed to close door US has exceeded 15 min.
103	Safety strip of door US has been tripped.
105	Contact of door CS has opened during an active program.
106	Time elapsed to open door CS has exceeded 15 min.
107	Time elapsed to close door CS has exceeded 15 min.
108	Safety strip of door CS has been tripped.
110	Pressure in wash system has fallen below minimum (option).
112	Leak indicator in floor pan has been tripped.
113	Roto-Rack sensor does not recognize docking.
121	Level sensor is defective or disconnected.
131	Temperature sensor for wash chamber is defective or disconnected.
132	Temperature sensor in dryer 1 is defective or disconnected.
133	Temperature sensor in dryer 2 is defective or disconnected.
134	Temperature sensor for DI-boiler is defective or disconnected.
141	Fill monitor does not recognize any change in water level during filling operation of wash chamber with CW (cold water).
142	Fill monitor does not recognize any change in water level during filling operation of wash chamber with WW (warm water).

143	Fill monitor does not recognize any change in water level during filling operation of wash chamber with DI-W (DI. Water).
147	Max. safety level in wash chamber has been reached.
148	Fill monitor does not recognize any change in water level during drainage.
151	Flow meter 1 does not recognize the required pulses during dosing.
152	Flow meter 2 does not recognize the required pulses during dosing.
153	Flow meter 3 does not recognize the required pulses during dosing.
154	Flow meter 4 does not recognize the required pulses during dosing.
161	Temperature sensor in wash chamber floor does not recognize any change in temperature during heating phase.
180	During SM 3000 operation, WD240 was cut off by 0-I button.
181	Machine does not recognize any rack coding.

2.7 Cleaning and preventive Maintenance

Daily cleaning and regular service are prerequisites for trouble-free operation of the machine.

Wash chamber must be checked daily. The sieve system must be cleaned and any foreign objects removed.

The level in the additive storage containers must be checked daily and, if needed, refilled.

The customer, (normally the technical service of the hospital), is responsible for the periodic preventive maintenance activities according to the advisories in this chapter. All such activities are to be carried out and a test report is to be filled out.

For maintenance service and consultations, please call on our customer service.

Caution:

Machine enclosure must never be hosed down with pressure hose. The machine is not designed to be splash-proof.

2.7.1 Service Intervals

The frequency of maintenance may vary according to application, environmental circumstances, water quality etc. The maximum number of batches processed or the elapsed time between maintenance events is shown below. The machine's display will indicate when service is due ("Periodic Service").

	Number Batches	Months
Start-up	0	0
1st Service	1000	12
2nd Service	2000	24
3rd Service	3000	36
Subsequent service	+ 1000	+ 12

2.7.2 Maintenance Items

NOTE: The WD240 comes from the factory with UL certification. All replacement items should be the same as those originally supplied on the WD240, or an approved replacement.

Clamp Connections

Clamp connections must be checked for clamp movement, may need re-tightening. Over-torque connections are to be replaced.

Dryer System

Replace HEPA filter.

Check dryer system for efficiency and tightness. Clean entire unit. Check both blower units for proper operation by means of individual (manual) control.

Dosing System

Check dosing system for tightness and accuracy. Replace dosing hoses. Connecting angle brackets in wash chamber are to be checked for tightness and the hose connections must be checked for proper tightness of their clamps.

Water Input Valves

Input valves must be checked for closing and for permeability. In case of insufficient closing strength, replace valve(s). Clean and (if needed) replace pre-filters.

Wash system

Clean wash system and check for contamination (dirt), remove any foreign objects .

Clean and check water jets on wash arms and docking points.

Check bearing rings of wash arms for wear, replace if needed.

Check drain valve and re-circulating pump for function and tightness.

Doors

Check toothed belt of door, adjust (if needed) by means of door spanner.

Functional inspection of entire door system.

Carefully clean door seal with a mild detergent, then treat with silicon grease.

Make sure door retracts fully. The front end bolts are not provided with lock washers, therefore need to be re-tightened.

Electrical Installation

Inspect entire electrical installation. Replace any defective components. Inspect plug and clamp connections, dubious connectors must be replaced.

Temperature monitoring System

Sensors and limiters of the temperature monitoring system must be checked for proper operation. Defective or visibly altered components must be replaced. Check calibration of t1.

Use check list, it supports efficient and comprehensive inspection.

2.7.3 Test Report

Following completion of all service work, a service report must be filled out. Actual readings are to be taken and compared with preset values. Components that show unacceptable values are to be replaced. Such inspections and replacements are to be listed in service report.

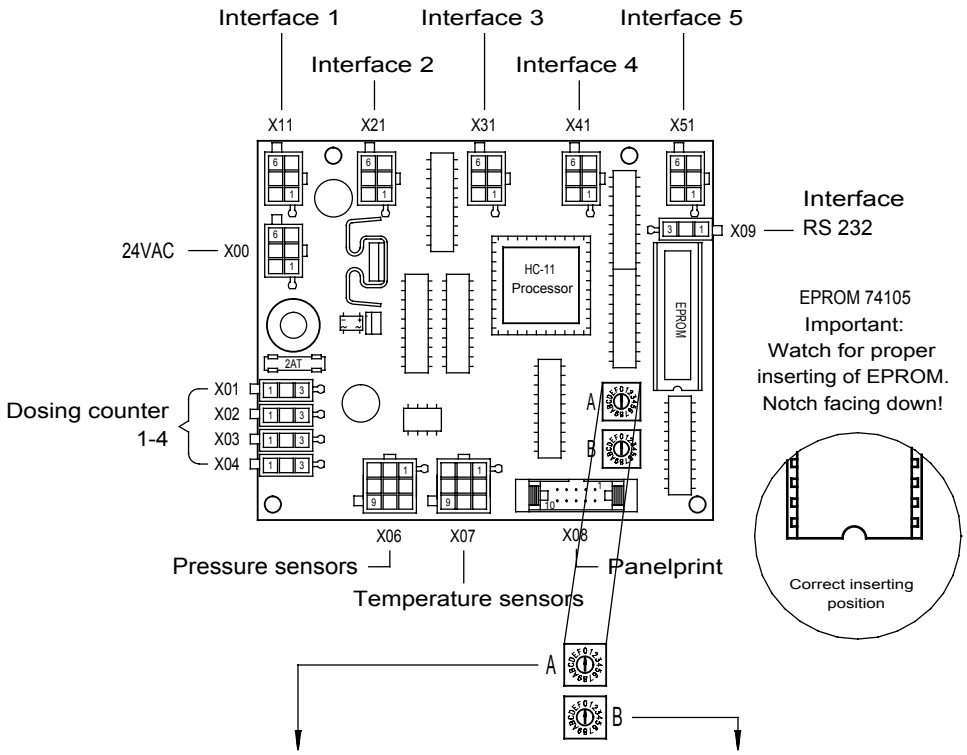
The test report confirms and records all service items and repairs performed.

3. Service Programs

3.1 Functions of Code Switch

Code Switch on Processor Print (adjustments / set-up)

The code switch is found on processor print which is located on service drawer on the unclean side of machine. Adjustments on switch may only be carried out by trained professional personnel. Pic. 74170-19



Code Switch A		Code Switch B	
0	**normal operation**	**C**	**12 programs**
1	**phase leap frog**		
2	**pressure**		
3	**temperature**		
4	**flow**		
6	**single activation**		
7	**batch counter**		
8	**codes**		
A	**program library initialization**		
B	**programming**		
C	**calibration flow meter**		
D	**regeneration**		
E	**boiler**		

Adjusting code switch by push buttons (external)

In case of automatic rack loading, pulling out the control service drawer is hampered. Therefore, the machine has been designed to permit code switch adjustment electronically by means of the key board.

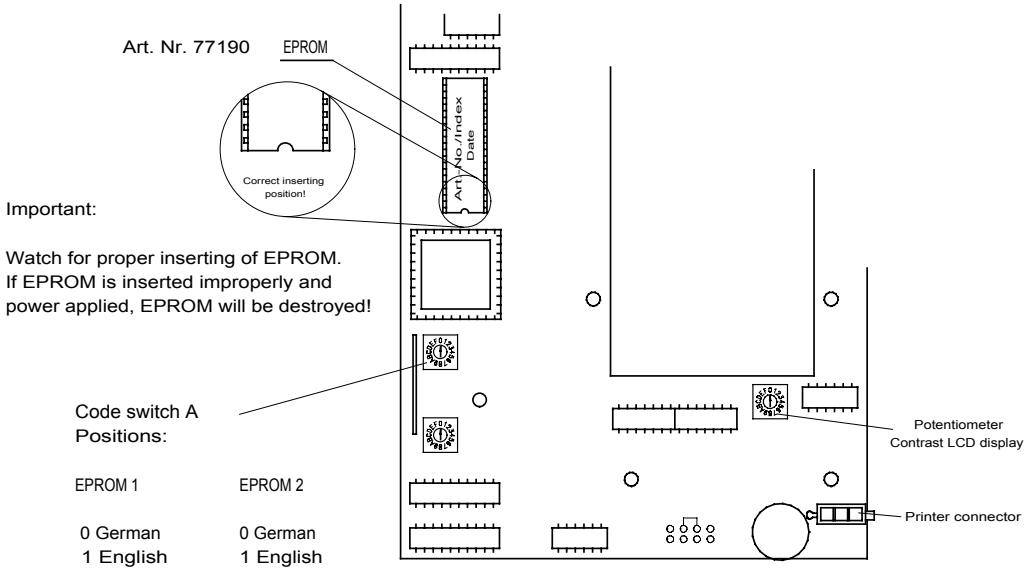
1. Cut off machine by I / O button.
2. Push door switch for 10 seconds.
3. Display blinks, showing respective service mode. Repeated button action advances to subsequent service modes.

Code Switch on Panel Print (languages / readouts)

Code switch is located on panel print, located on back side of service door.

Adjustments on switch may only be carried out only by trained professional personnel.

Pic. 56968

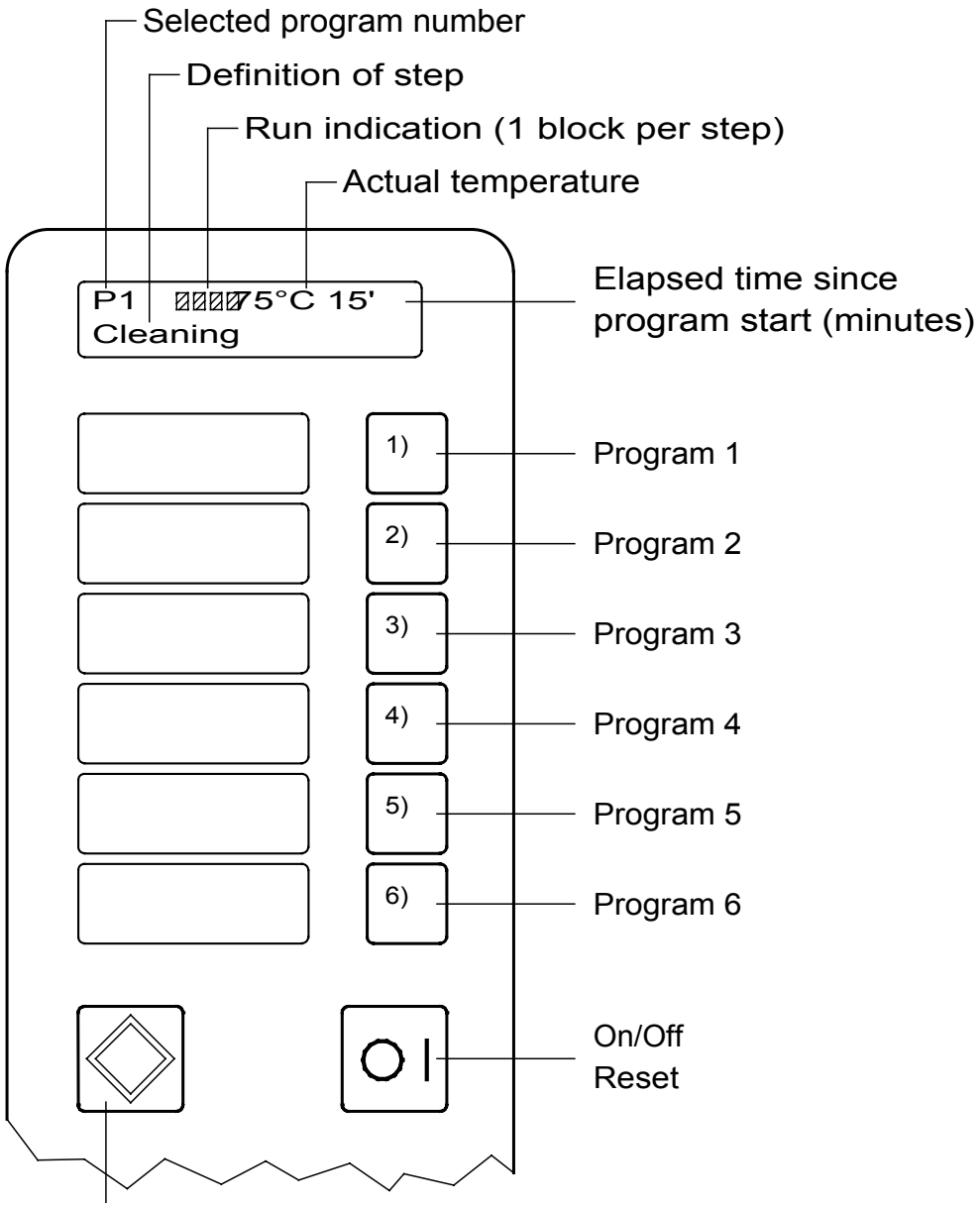


EPROM 1	EPROM 2
0 German	0 German
1 English	1 English
2 French	2 Polish
3 Italian	3 Czech
4 Spanish	4 Turk
5 Finnish	
6 Schwedish	
7 Norwegian	
8 Dutch	
9 Spare	

3.2 Code Switch Position 0, Normal Operation

During normal operation, display shows current program status. For programming of respective program buttons, see code switch positions A and B.

Pic. 77218-17



3.3 Code Switch Position 1, Step Bypass

This mode allows for bypassing of program steps on machine start-up. Select desired program. Display shows the usual status indications. Quickly repeated pushing of one program button results in jumping over that program step. The bypass mode is only active while button blinks. Be sure that the selected program button is supported by the respective program steps, otherwise, an error indication will result.

3.4 Code Switch Position 2, Reading of Level Sensor

Display shows actual reading of output voltage of level sensor. If display shows "=.==" instead of a reading, there is either no sensor attached or there is no power.

p	1		0	.	5	0	V					p	3		=	.	=	=	V
p	2		=	.	=	=	V					p	4		=	.	=	=	V

p1 = Level sensor (V) $f_{(U)}$ = 7.5 x Voltage in V - 3.75 = mbar

Level sensor

Technical Data:	Operating voltage:	24 V DC
Pressure range:	0 - 30 mbar	
	Output signal:	0.5 - 4.5 V DC
Levels:	Empty level (LV)	0.5 V

3.5 Code Switch Pos. 3, Reading of Temperature Sensors

Display shows actual temperatures readings of the sensors in °C. If display shows "=.==" instead of a reading, there is either no sensor attached or there is no power.

T	1			4	5	°	C					T	3			9	3	°	C
T	2			9	3	°	C					T	4			=	=	°	C

T1 = Temperature sensor in wash chamber floor

T2 = Temperature sensor in dryer 1

T3 = Temperature sensor in dryer 2

T4 = empty, no voltage (Option VE Boiler)

Temperature Sensors

Type sensor:		NTC 10 kΩ (thermistors)
Data: Temperature range:		0 - 130°C
Brand name:		Wilmens Sensor
Resistance:	20 °C =	12.490 kΩ
	25 °C =	10.000 kΩ
	40 °C =	5.331 kΩ
	60 °C =	2.490 kΩ
	80 °C =	1.256 kΩ
	100 °C =	0.677 kΩ

3.6 Code Switch Pos. 4, Readings of Flow Meters

Display shows actual readings of flow through dosing pumps in current step phases of the program run. Flow meters are optional equipment.

1		0	6	8	5	I	M	P			3		0	0	0	0	I	M	P
2		0	0	0	0	I	M	P			4		0	0	0	0	I	M	P

1 = Pulse count, flow meter 1
2 = Pulse count, flow meter 2
3 = Pulse count, flow meter 3
4 = Pulse count, flow meter 4

Flow Meters Brand name: IG 72.01 Gehrig

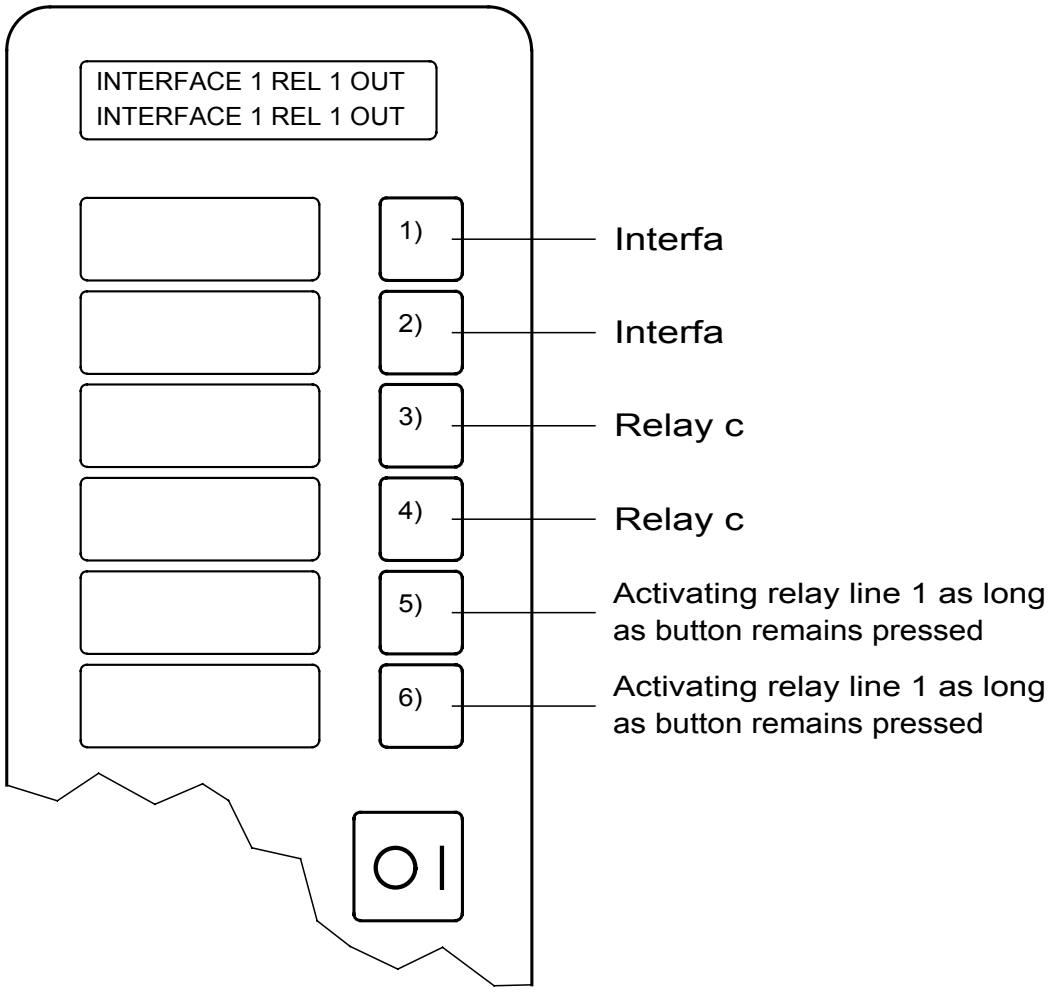
Operating voltage: 24 V / DC

3.7 Code Switch Pos. 6, Individual Test Mode of Outputs

This mode permits direct control of all motors, valves and heater registers. Display shows respective interface along with selected output (see following list of outputs).
By pressing button 1 or 2, the interface is selected on which the to-be-tested relay is located.
Push button 3 or 4 selects the desired relay.
With push button 5 or 6, the selected relay is actuated. Button 5 is for the upper line, button 6 for the lower line.

Interface 1 can only be actuated if the two upper doors are closed!

Pic. 77218-16



3.7.1 List of Outputs for direct Control

Interface	Relay	Item	Markings
INTERFACE 1	REL 1	CW valve (cold water)	Y 11
	REL 2	WW valve (warm water)	Y 12
	REL 3	DI valve (DI. Water)	Y 13
	REL 4	Dryer heater 2	K 14
	REL 5	Wash pump	K 15
	REL 6	Wash chamber heater	K 16
	REL 7	Dryer blower	K 17
	REL 8	Dryer heater 1	K 18
INTERFACE 2	REL 1	Dosing pump 1	M 21
	REL 2	Dosing pump 2	M 22
	REL 3	Dosing pump 3	M 23
	REL 4	Dosing pump 4	M 24
	REL 5	Lift motor US open	K25
	REL 6	Lift motor US close	K 26
	REL 7	DI or CW condenser (option)	Y 27
	REL 8	Drain valve	Y 28
INTERFACE 3	REL 1	Lift motor CS door open	K 31
	REL 2	Lift motor CS door close	K 32
	REL 3	Signal program run	K 33
	REL 4	LED ticker (door) CS	H 34
	REL 5	Buzzer push button print CS	H 35
	REL 6	DI pump tank (option)	K 36
	REL 7	DI boiler heater (option)	K 37
	REL 8	CW cooling drain (option)	Y 38

3.8 Code Switch Position 7, Batch Count / Service Interval

3.8.1 Batch Count

Display (first line) shows subtotal of batches processed.

P	R	O	G	R	A	M		1	-	6				0	0	0	2	3	4
S	E	R	V	I	C	E								0	0	1	0	0	0

Grand total of batches run may be called as follows: with code switch position 0, press “O-I” button. Grand total is shown on lower line, right end.

3.8.2 Service Interval

A service warning is shown upon completion of a pre-set number of batches.

!	P	E	R	I	O	D	I	C	A	L		S	E	R	V	I	C	E	!

Service interval batch number may be adjusted in steps of 100 by pressing button 3 or 4 (Fast track: Hold down button 3 or 4 for more than 1 minute). If lower line shows “000”, maintenance indication is turned off.

3.9 Code Switch Position 8, Error Codes

Request

Display shows last 10 errors codes (lower line).

																0		
										F	A	U	L	T		1	2	1

By means of button 3 or 4, the last 10 (0 - 9) error codes may be displayed. Numeral 0 on first line represents the latest incident, 9 the oldest.

Reset

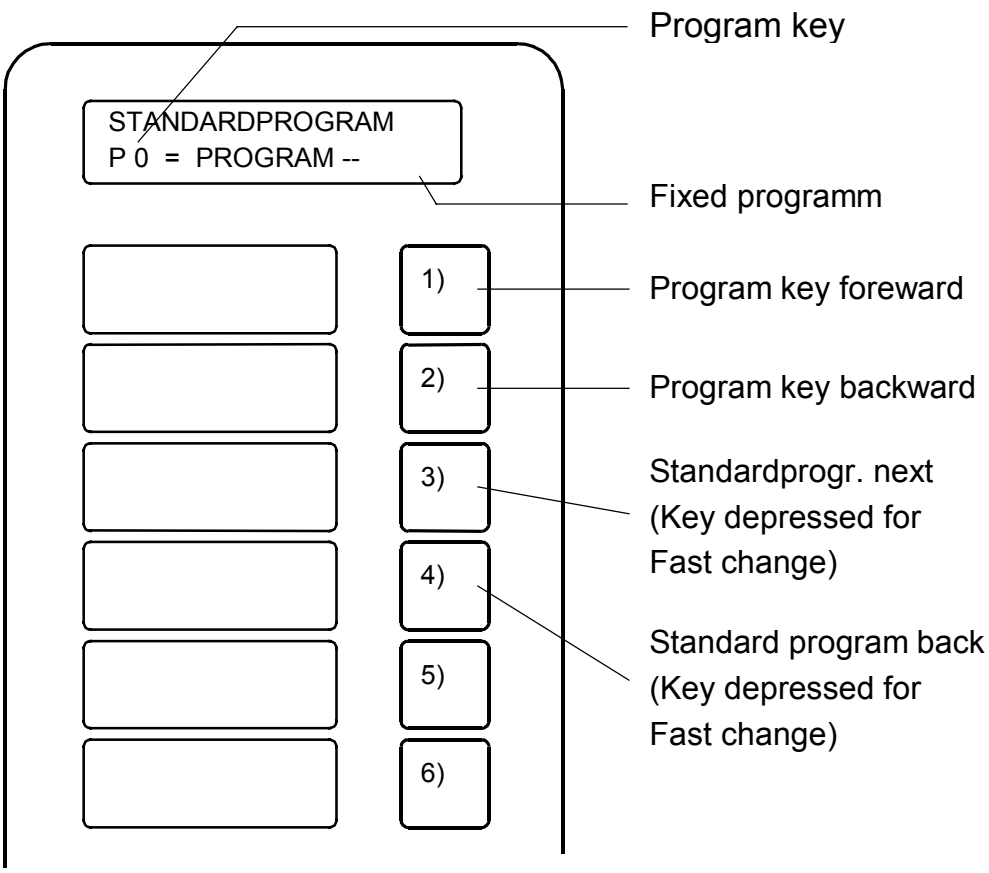
Holding down button 5 for more than 2 seconds, all error codes will be reset.

3.10 Code Switch Position A, Program Library / Reset

Assignment of Programs to Program Buttons

This mode permits assignment of push buttons 1 - 6 to individual, pre-defined standard programs. Each of these standard programs may be individually custom adapted. For such adjustments, use code switch B (free programming). See chapter Program Data.

Pic. 77216-23



Resetting standard Program Data

By entering standard program #. 00, all program data will be canceled.

3.10.1 List of Standard Programs 60HZ Machines only

00 Programmed settings are erased
01 Instruments Normal
02 Instruments Intensive
03 Instruments Quick (no drying)
04 Instruments No Lube
05 Basins
06 Enzymatic
07 N/A
08 N/A
09 N/A

30 N/A
31 N/A
32 N/A
33 N/A
34 N/A
35 N/A
36 N/A
37 N/A
38 N/A
39 N/A

40 N/A

80 N/A
81 N/A
82 N/A
83 N/A
84 N/A
85 N/A
86 N/A
87 N/A
88 N/A
89 N/A
90 Test program
91 Test program with Condensate.

3.11 Code Switch Position B, Entering Program Steps

In this mode, program buttons 1 - 6 may be freely programmed. In mode code switch A, pre-programmed fix programs may be assigned to program buttons 1 - 6.

Each program button can handle up to 9 program steps (Step 1 - 9).

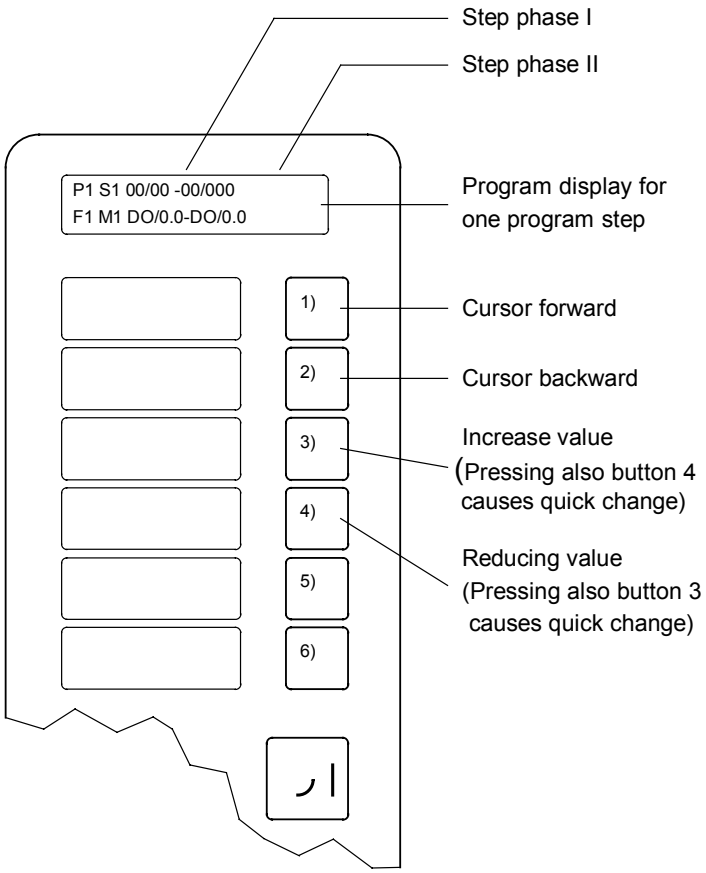
To each program step, one medium (medium M 1 - 9) may be assigned (see list below).

Steps F1-9 are defining as per list below.

Pic. 77218-14

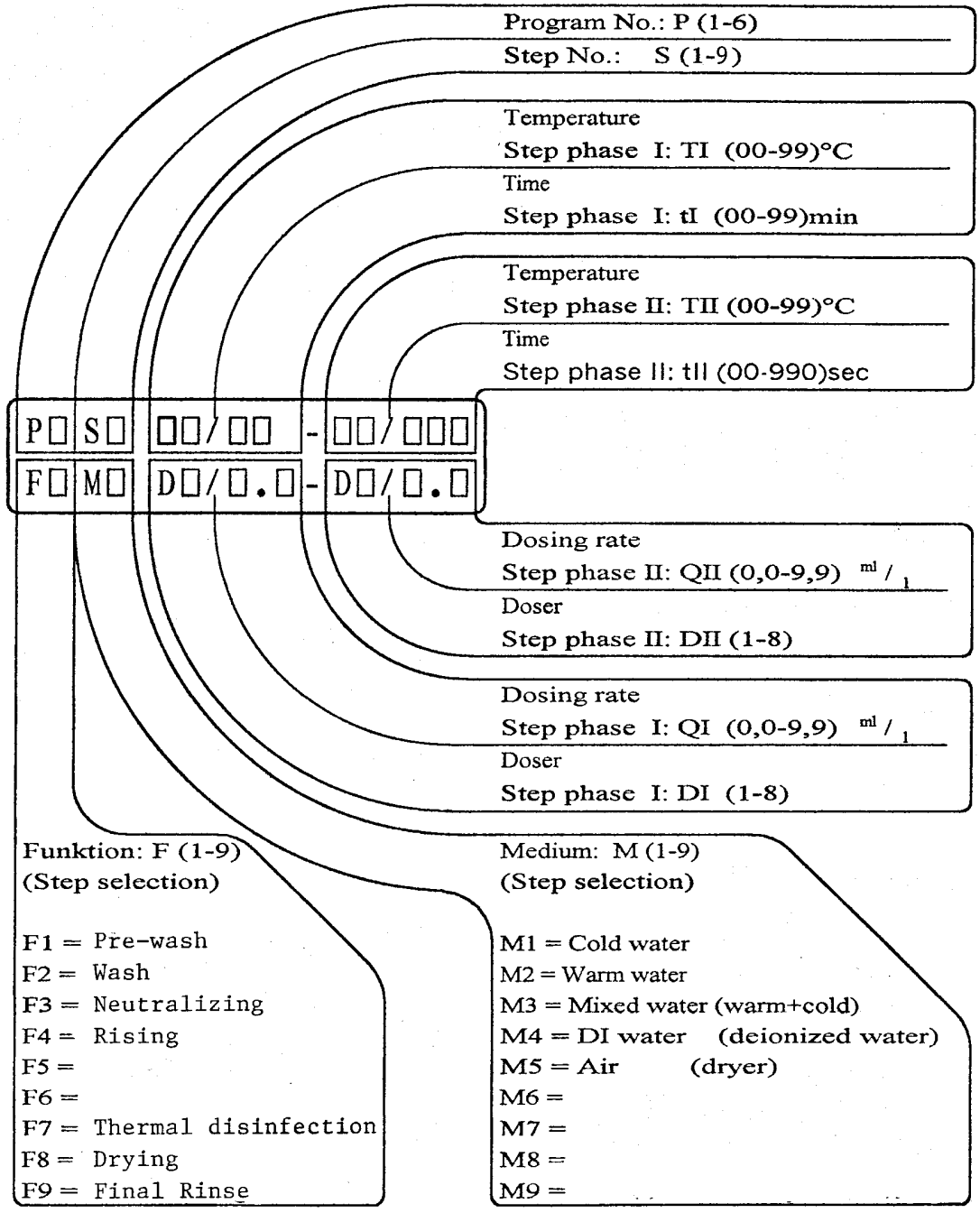
Each program step consists of two step phases (I + II). To each step phase, a temperature (TI and TII) with a respective dwell time (tI and tII), a dosing pump (D1-4) and dosing quantity (QI and QII) are to be defined.

Note: the requested dwell time tI and dII starts to elapse only after the required temperature TI and TII has been reached and dosing QI and QII has stopped.



Explanation to Programming Display

Pic. 77218-19

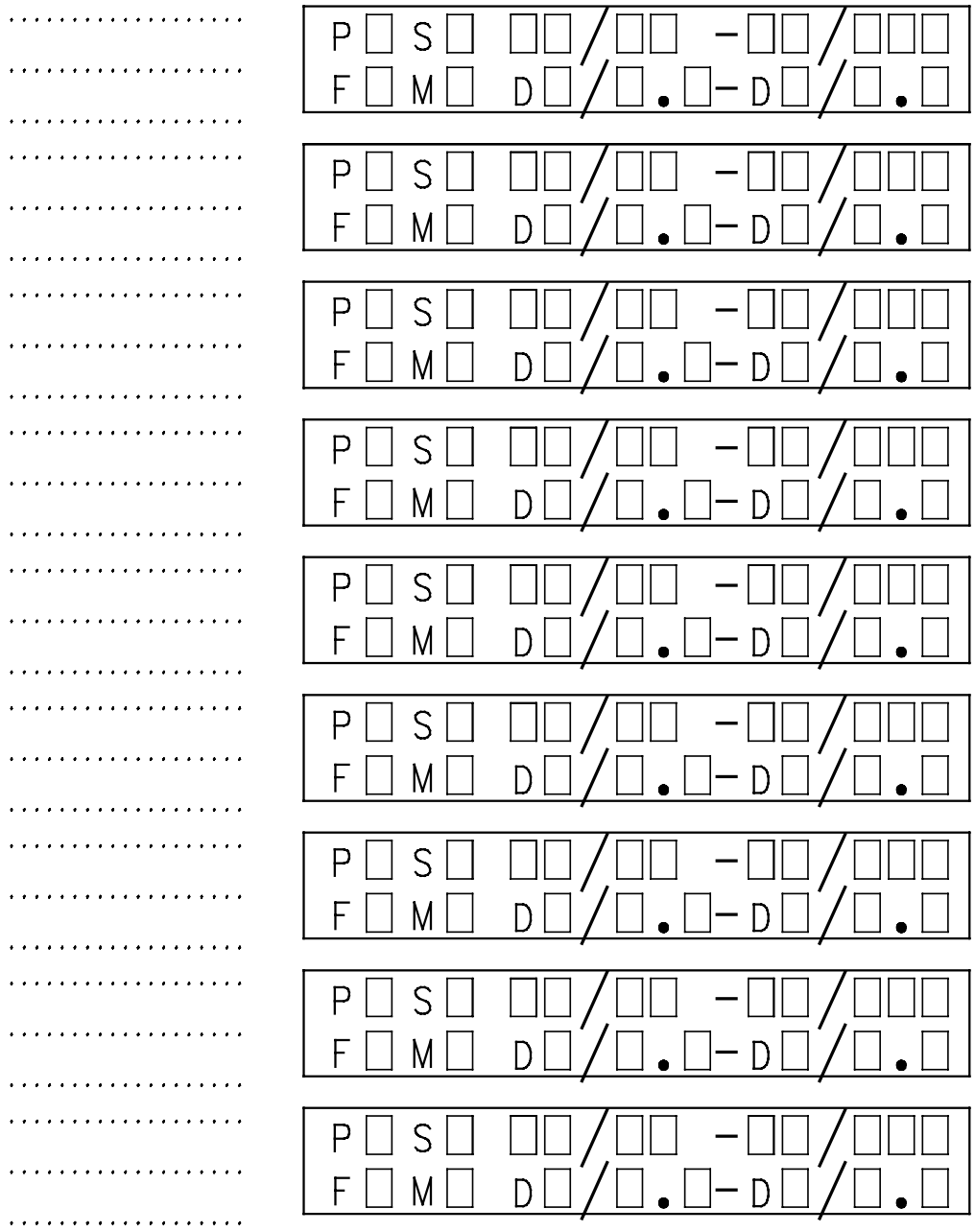


Program Definition: _____

Program Button:

Step Name Program data

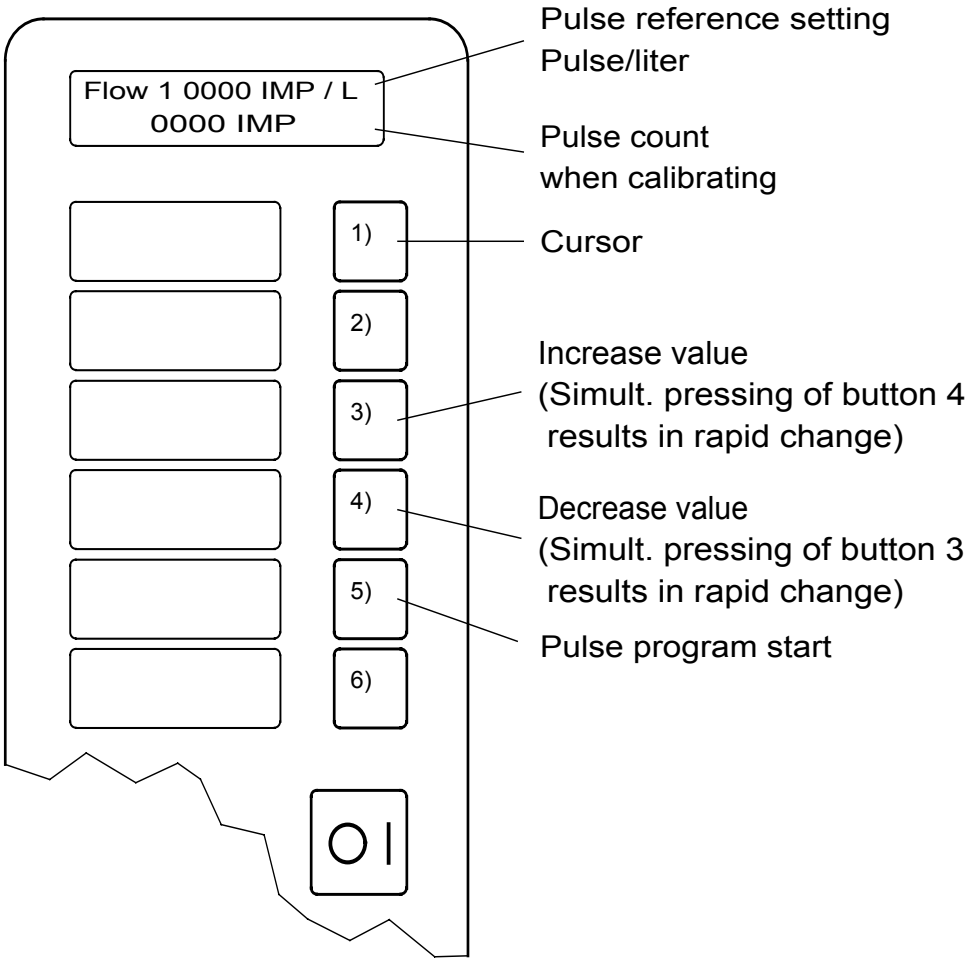
Pic. 54980-95



3.12 Code Switch Position C, Calibrating Dosing System

Calibration can only be accomplished with the help of flow meters (option).

This mode allows calibration of dosing agents with reference to their viscosity.
Pic. 77218 -13



Cursor Position:	1	“Flow 1-4” Flow meter Dos 1/2/3/4
	2	Reference setting: pulses per liter
	3	Counting pulses during calibration

Sequence:

1. Fill additive into a 1 liter calibrating container.
2. Select flow meter 1 - 4.
3. With button 5, activate selected dosing pump. Siphon dosing agent from calibrating container. On second line of display, pulses are summarized until calibrating container is empty. This sum equals number of pulses per liter.
4. Enter the resulting number of pulses on first line.

4. Program Data

4.1 Instruments Normal (Standard wash program)

Program (cycle) duration approx. 30'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**,plus Heat-up time
1	Pre-Wash	Mixed water	20°C		2 min.
2	Washing	Hot water	60°C	Detergent 3.0ml/l	4 min.
3	Neutralize	Hot water	Supply temp.	Neutralizer 1.0ml/l	2 min.
4	2nd Rinse	Hot water	Supply temp.		30 sec.
5	Thermal Dis.	DI water	93°C	Lubricant 0.3ml/l	2 min.
6	Drying	Air	99°C		12 min.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Thermal Disinfection –1 to +3°C

4.2 Instruments Intensive (heavily soiled)

Program (cycle) duration approx. 35'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**,plus Heat-up time
1	Pre-Wash	Mixed water	20°C		2 min.
2	Washing	Hot water	60°C	Detergent 4.0ml/l	6 min.
3	Neutralize	Hot water	Supply temp.	Neutralizer 1.3ml/l	2 min.
4	2nd Rinse	Hot water	Supply temp.		30 sec.
5	Thermal Dis.	DI water	93°C	Lubricant 0.3ml/l	2 min.
6	Drying	Air	99°C		12 min.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Thermal Disinfection –1 to +3°C

4.3 Instruments - No Lubricant

Program (cycle) duration approx. 30'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**, Heat-up time
1	Pre-Wash	Mixed water	20°C		2 min.
2	Washing	Hot water	60°C	Detergent 3.0ml/l	4 min.
3	Neutralize	Hot water	Supply temp.	Neutralizer 1.0ml/l	2 min.
4	2nd Rinse	Hot water	Supply temp.		30 sec.
5	Thermal Dis.	DI water	93°C		2 min.
6	Drying	Air	99°C		12 min.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Thermal Disinfection –1 to +3°C

4.4 Instruments – Quick (No Drying)

Program (cycle) duration approx. 20'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**, Heat-up time
1	Pre-Wash	Mixed water	20°C		2 min.
2	Washing	Hot water	60°C	Detergent 3.0ml/l	4 min.
3	Neutralize	Hot water	Supply temp.	Neutralizer 1.0ml/l	2 min.
4	2nd Rinse	Hot water	Supply temp.		30 sec.
5	Thermal Dis.	DI water	93°C	Lubricant 0.3ml/l	2 min.
6	Drying	Air	No temp.		30 sec.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Thermal Disinfection –1 to +3°C

4.5 Basins

Program (cycle) duration approx. 28'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**, Heat-up time
1	Pre-Wash	Mixed water	20°C		2 min.
2	Washing	Mixed water	60°C	Detergent 3.0ml/l	4 min.
3	Neutralize	Hot water	Supply temp.	Neutralizer 1.0ml/l	2 min.
4	2nd Rinse	Hot water	Supply temp.		30 sec.
5	Thermal Dis.	DI water	93°C		2 min.
6	Drying	Air	99°C		10 min.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Thermal Disinfection –1 to +3°C

4.6 Enzymatic Wash

Program (cycle) duration approx. 30'

Pos.	**Function**	**Medium**	**Temperature**	**Dosing media**	**Duration**, Heat-up time
1	Pre-Wash	Mixed water	20°C		1 min.
2	Washing	Hot water	45°C	Detergent 5.0ml/l	5 min.
3	2nd Rinse	Hot water	60°C		1 min.
4	3rd Rinse	Hot water	60°C		1 min.
5	Thermal Dis.	DI water	93°C		2 min.
6	Drying	Air	99°C		12 min.

Pre-Wash 20°C or the temperature of the cold water +-5°C

Wash +-5°C

Rinse +-5°C

Thermal Disinfection –1 to +3°C

5. Block Diagram

5.1 Hardware Configuration

Interface 1

Outputs		Inputs		
Y 11[12]	CW (cold water) valve, tank	S 11[07]		C
Y 12[08]	WW (warm water) valve, tank	S 12[08]	Identification WD 240	C
Y 13[04]	DI (DI. Water) valve, tank	S 13[04]		
Y 14[03]	Dryer heater 2 (NTC 3)	S 14[03]	DI tank code	C
K 15[02]	Re-circulating pump	S 15[02]	Pump monitoring	C
K 16[01]	Tank heater	S 16[05]	Rack code	C
K 17[05]	Dryer blower	S 17[06]	Rack code	C
K 18[09]	Dryer heater 1	S 18[09]	Rack code	C

Interface 2

Outputs		Inputs		
M 21[12]	Dosing pump 1	S 21[07]	Empty indication, dosing pump 1	O
M 22[08]	Dosing pump 2	S 22[08]	Empty indication, dosing pump 2	O
M 23[04]	Dosing pump 3	S 23[04]	Empty indication, dosing pump 3	O
M 24[03]	Dosing pump 4	S 24[03]	Empty indication, dosing pump 4	O
M 25[02]	Lift motor US open	S 25[02]	Door switch US, open door	O
M 26[01]	Lift motor US close	S 26[05]	Door switch US, open door	C
K 27[05]	CW / DI condenser	S 27[06]	Door safety US	C
Y 28[09]	Drain valve	S 28[09]	Leak indication, floor pan	C

Interface 3

Outputs		Inputs		
M 31[12]	Lift motor CS open	S 31[07]	Door switch CS, open door	O
M 32[08]	Lift motor CS close	S 32[08]	Door switch CS, close door	C
K 33[04]	Signal program run	S 33[04]	Door safety CS	C
H 34[03]	LED ticker, open door CS	S 34[03]	Button CS, open door	C
H 35[02]	Buzzer, door CS	S 35[02]	Coding CS Door	C
K 36[01]	DI tank drain	S 36[05]	Interface code	O
K 37[05]	Tank heater DI boiler	S 37[06]	DI boiler code	C
Y 38[09]	CW cooling drain	S 38[09]	Cooling drain 80°C	C

Interface 4 (optional)

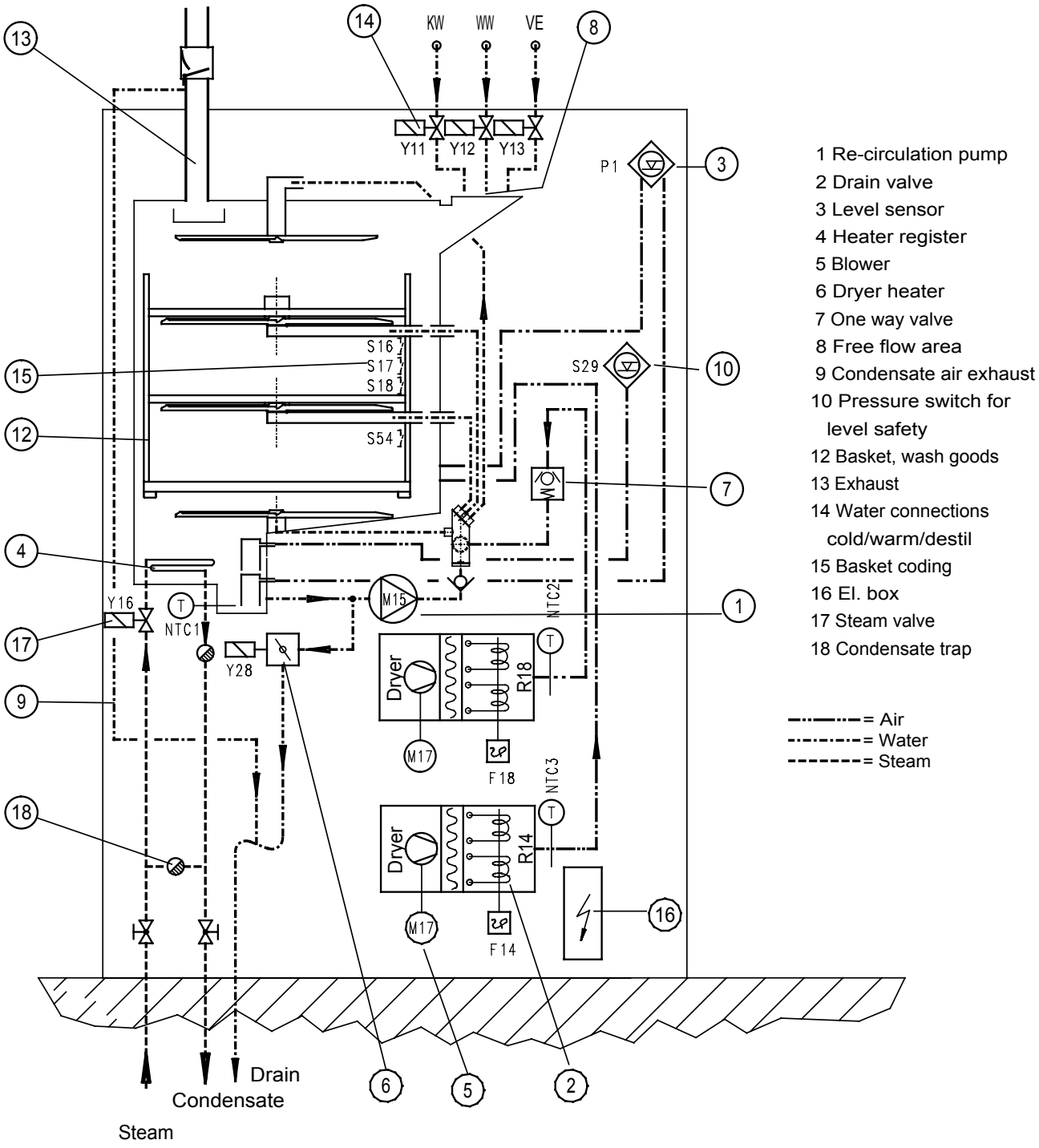
Outputs	**Inputs**

Interface 5 (Automatic Rack Drive / 24 VDC)

Outputs		**Inputs**		
K 51[12]	SM 3000 door US open	S 51[07]	SM 3000 open door US	C
K 52[08]	SM 3000 Rack position reached	S 52[08]	SM 3000 close door CS	C
K 53[04]	SM 3000 door CS open	S 53[04]	SM 3000 code	C
Y 54[03]	SM 3000 error signal	S 54[03]	SM 3000 position sensor, rack	C
K 55[02]	Signal program contact	S 55[02]		
K 56[01]	Signal main contact (o-I button)	S 56[05]	Interface code	O
K 57[05]		S 57[06]		
K 58[09]	SM 3000 signal, program run	S 58[09]		

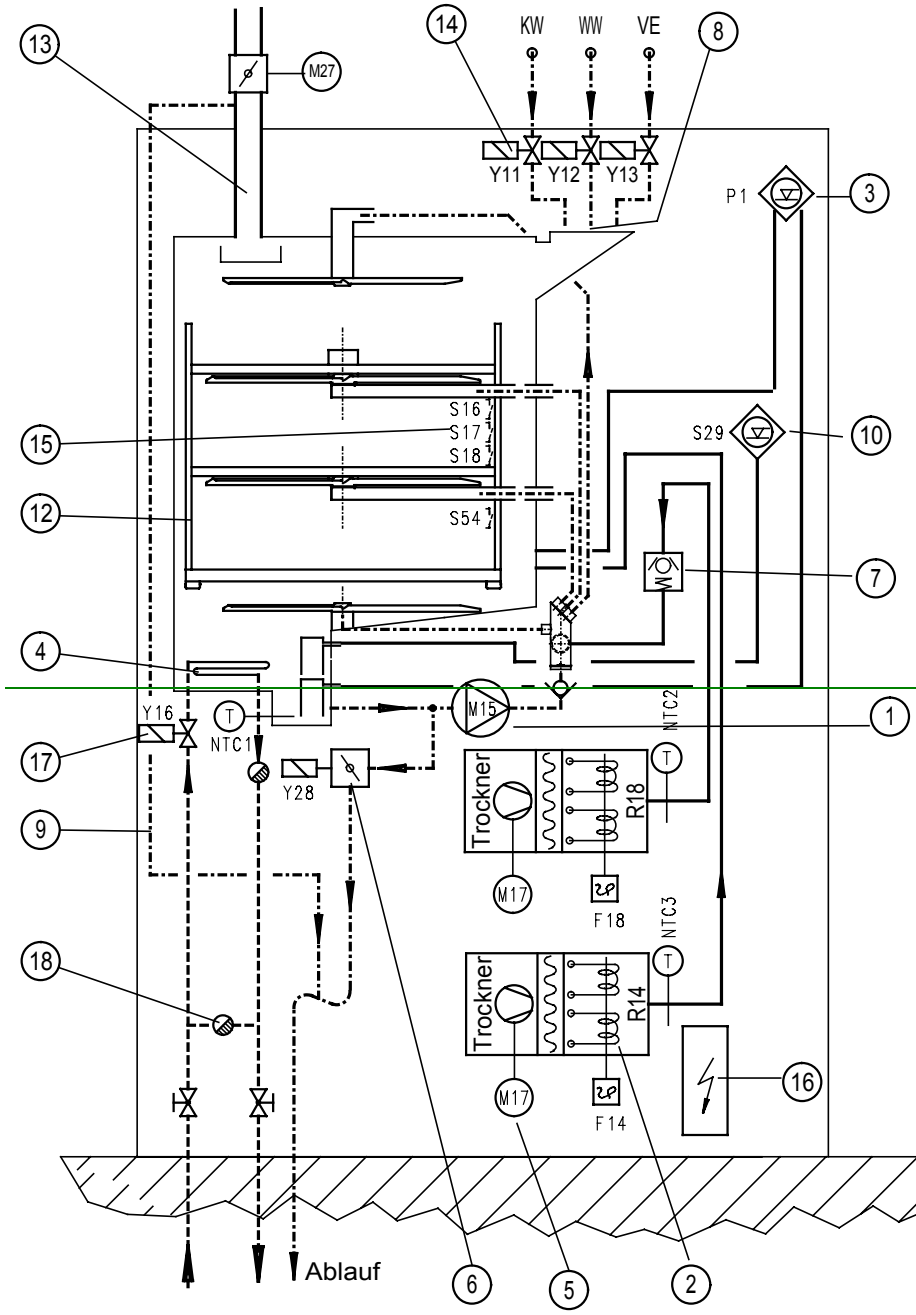
5.2 System Block Diagram (with Steam Heat)

Pic. 74170-2A



1 Re-circulation pump
2 Drain valve
3 Level sensor
4 Heater register
5 Blower
6 Dryer heater
7 One way valve
8 Free flow area
9 Condensate air exhaust
10 Pressure switch for level safety
12 Basket, wash goods
13 Exhaust
14 Water connections cold/warm/destil
15 Basket coding
16 El. box
17 Steam valve
18 Condensate trap

= Air
= Water
= Steam

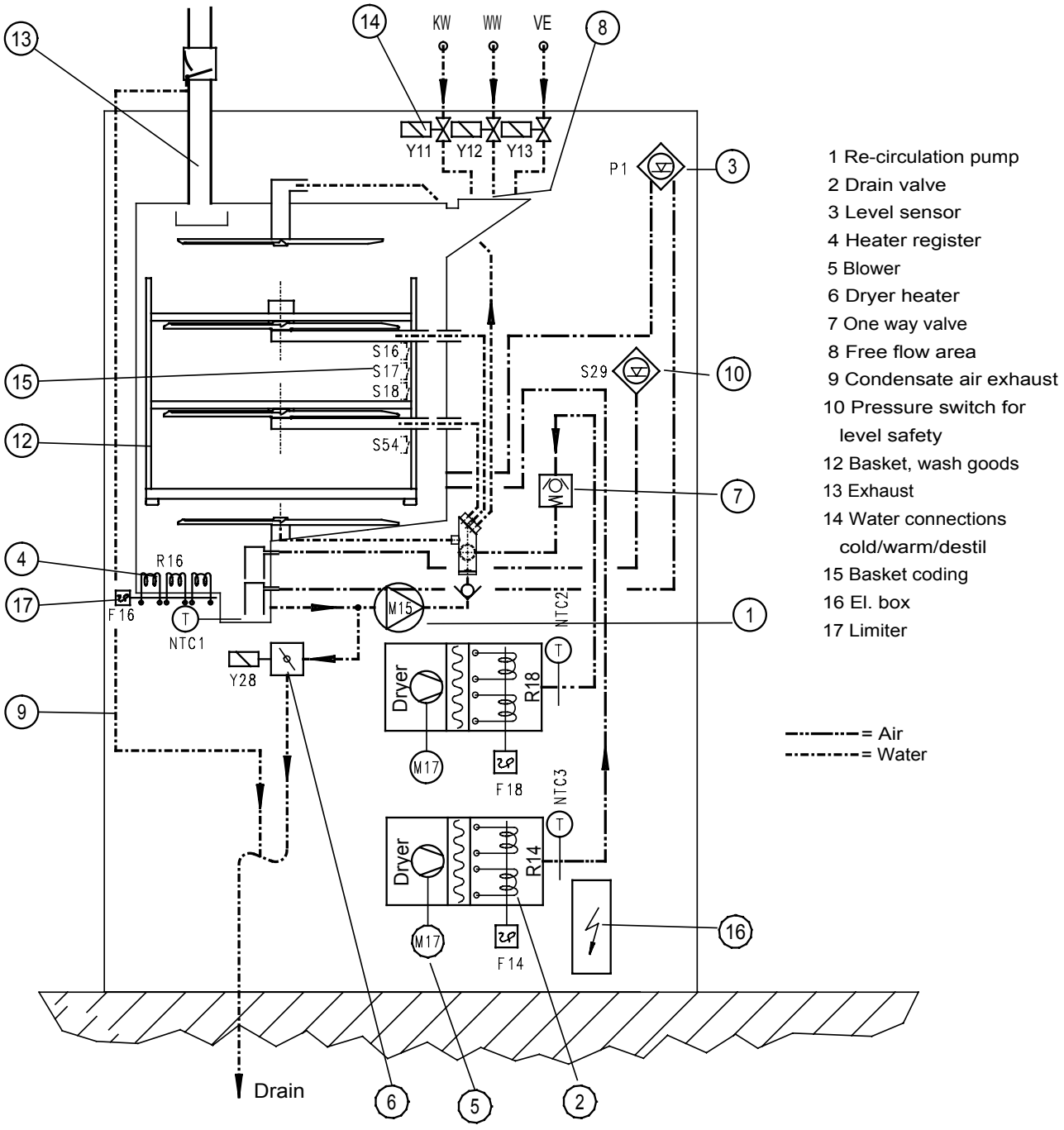


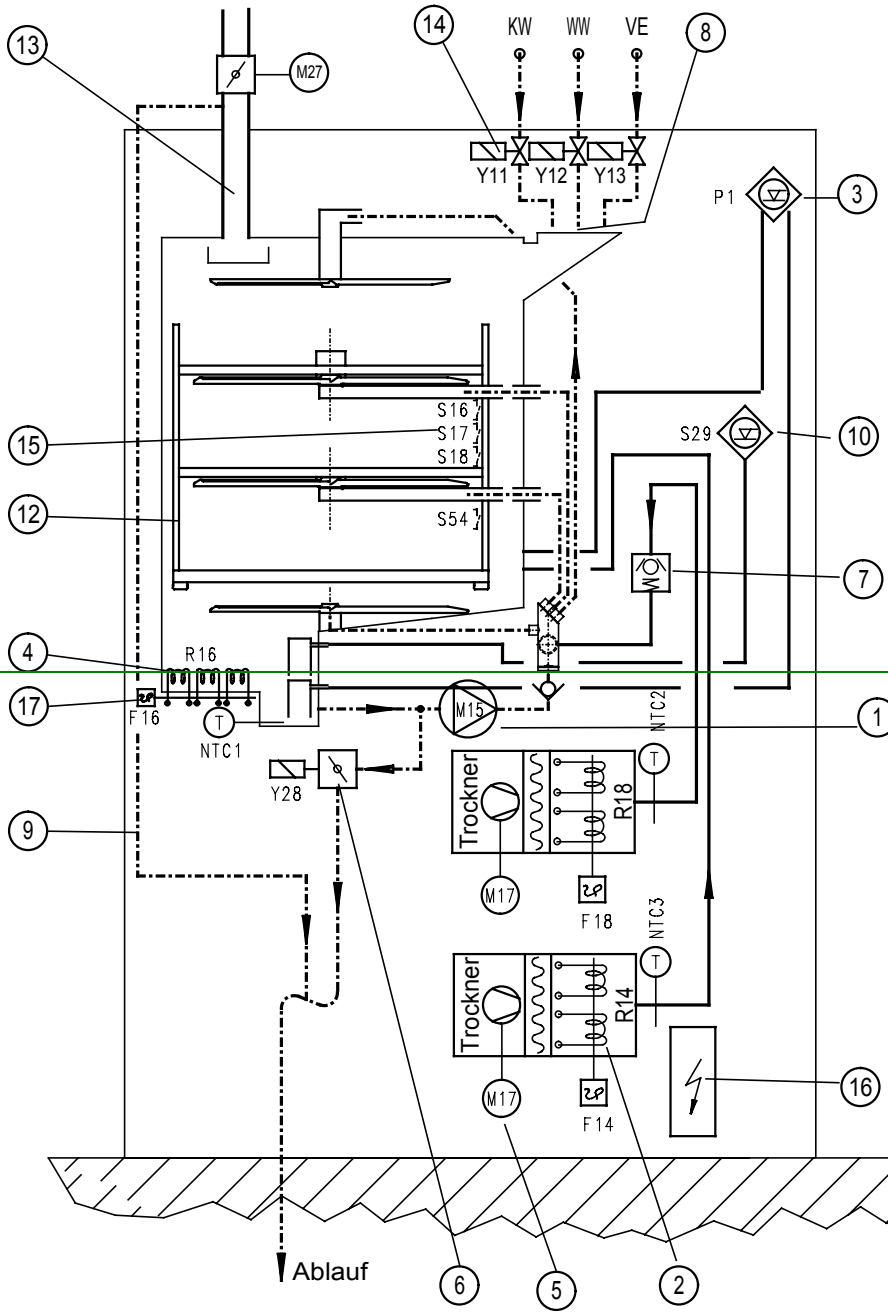
1 Umwälzpumpe
2 Ablassventil
3 Niveausensor
4 Heizkörper
5 Ventilator
6 Trocknerheizung
7 Rückschlagventil
8 Freie Fliesstrecke
9 Kondenswasser Abluft
10 Druckschalter für Sicherheitsniveau
12 Korb,Waschgut
13 Abluft
14 Wasseranschlüsse kalt/warm/destil
15 Korbcodierung
16 Elektrokasten
17 Dampfventil
18 Kondensatabscheider

= Luft
= Wasser
= Dampf

5.3 System Block Diagram (with Electric Heat)

Pic. 74170-1A



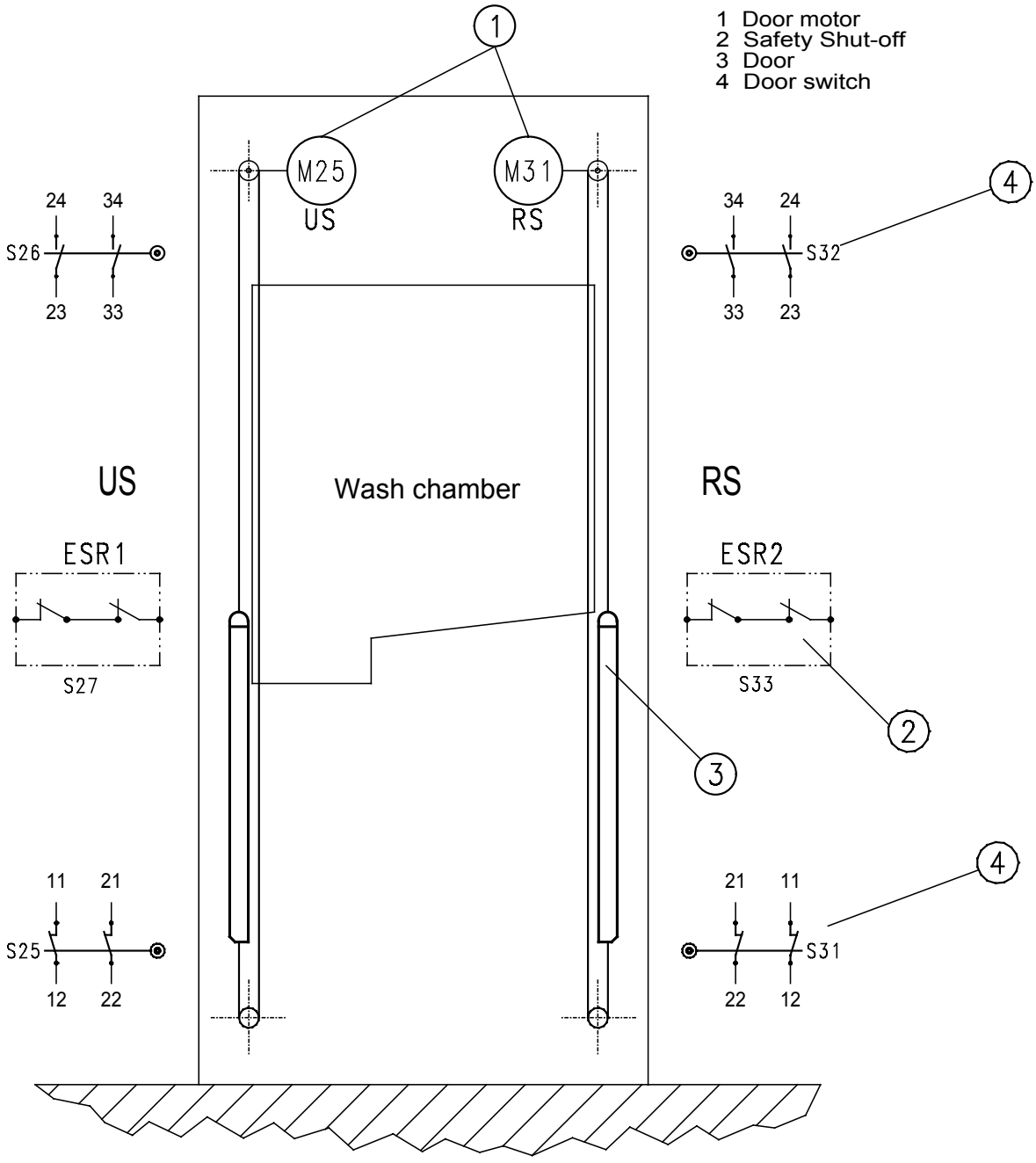


1 Umwälzpumpe
2 Ablassventil
3 Niveausensor
4 Heizkörper
5 Ventilator
6 Trocknerheizung
7 Rückschlagventil
8 Freie Fliesstrecke
9 Kondenswasser Abluft
10 Druckschalter Sicherheitsniveau
12 Korb,Waschgut
13 Abluft
14 Wasseranschlüsse kalt/warm/destil
15 Korbcodierung
16 Elektrokasten
17 Begrenzer

= Luft
= Wasser

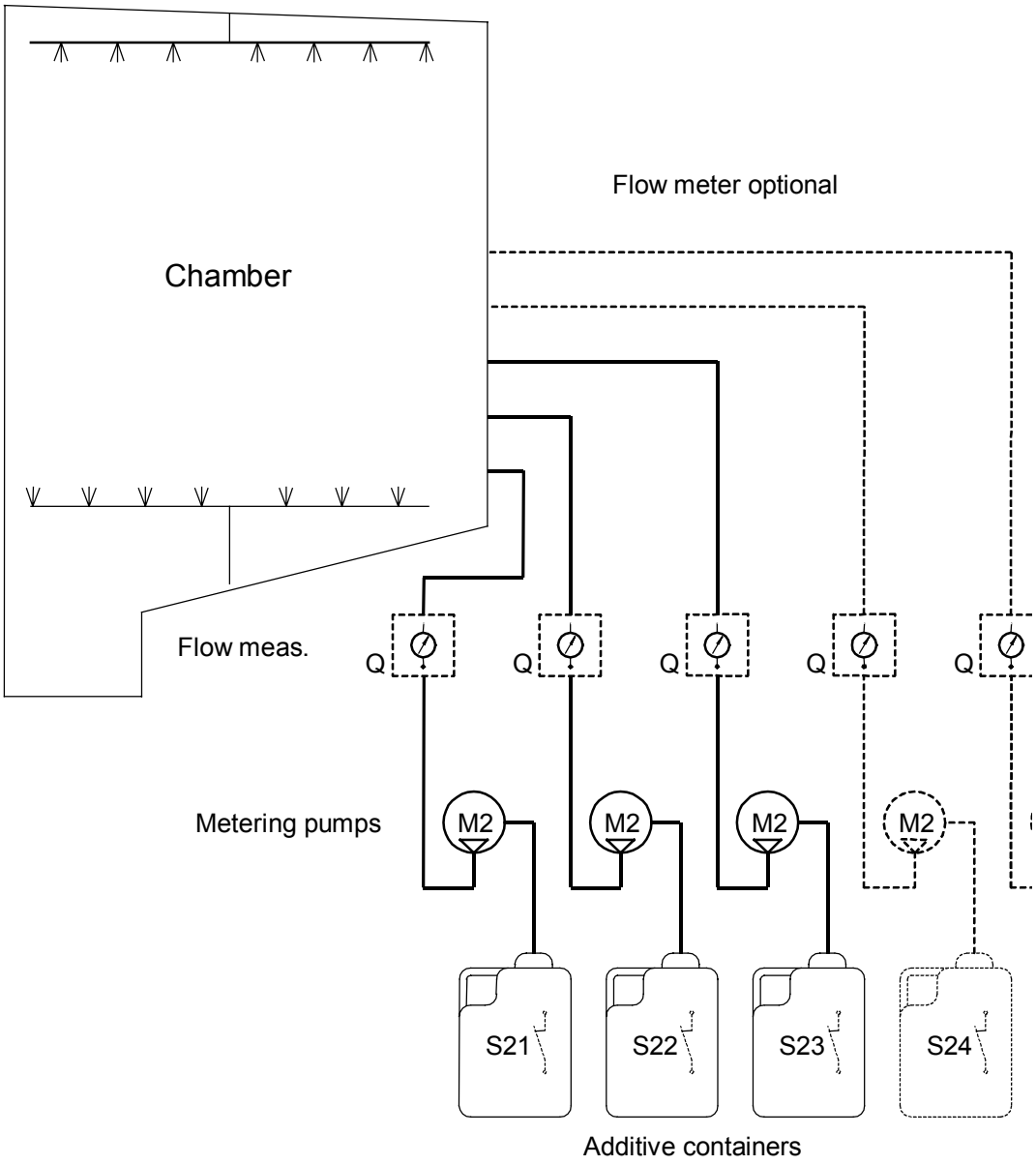
5.4 Function Schematic, Door

Pic. 74170-3



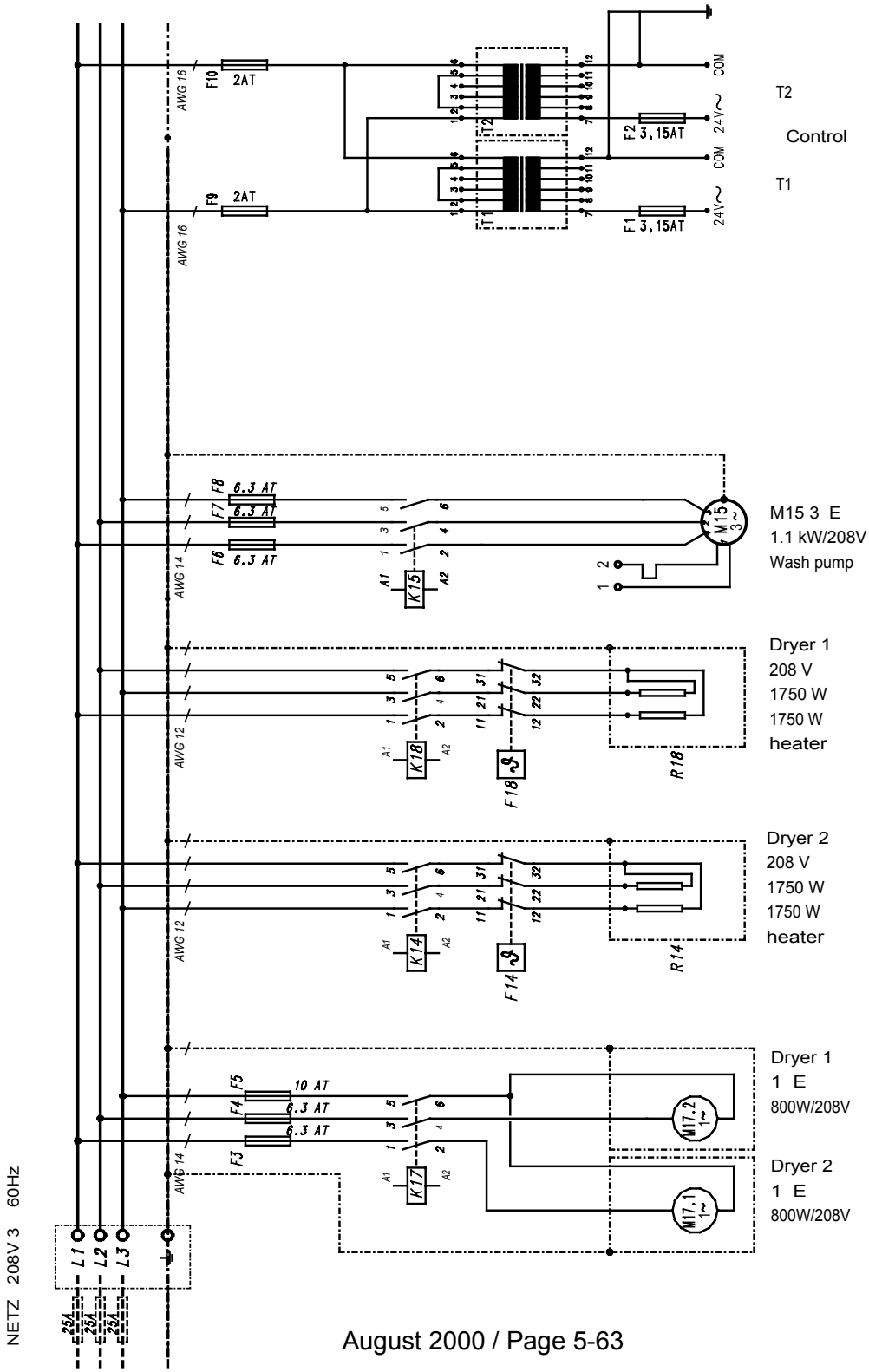
5.5 Function Schematic, Dosing

Pic. 74170-4



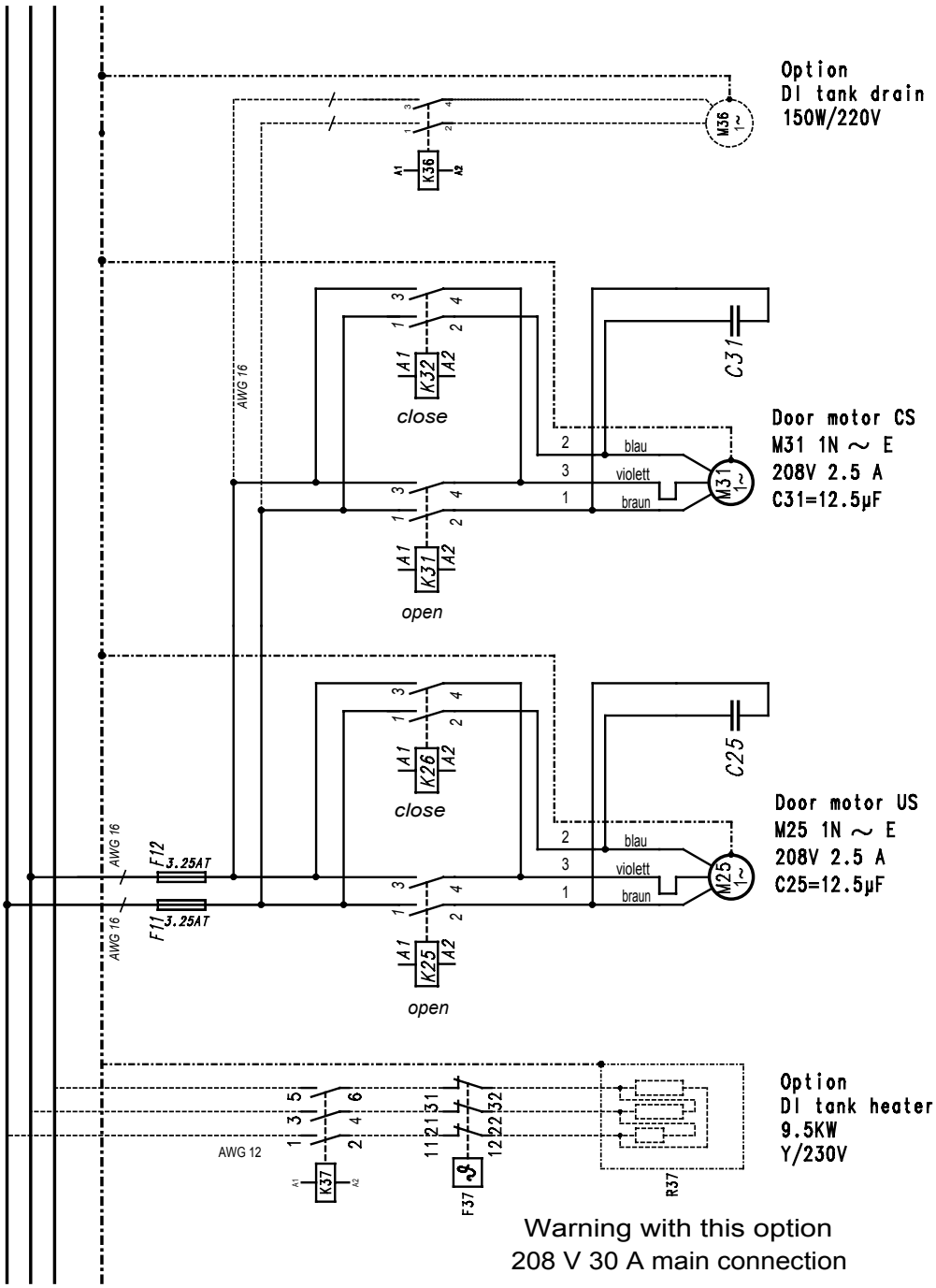
5.6 Wiring Diagram, 208 V / 60 Hz (with Steam Heat)

Pic. 74170-8A



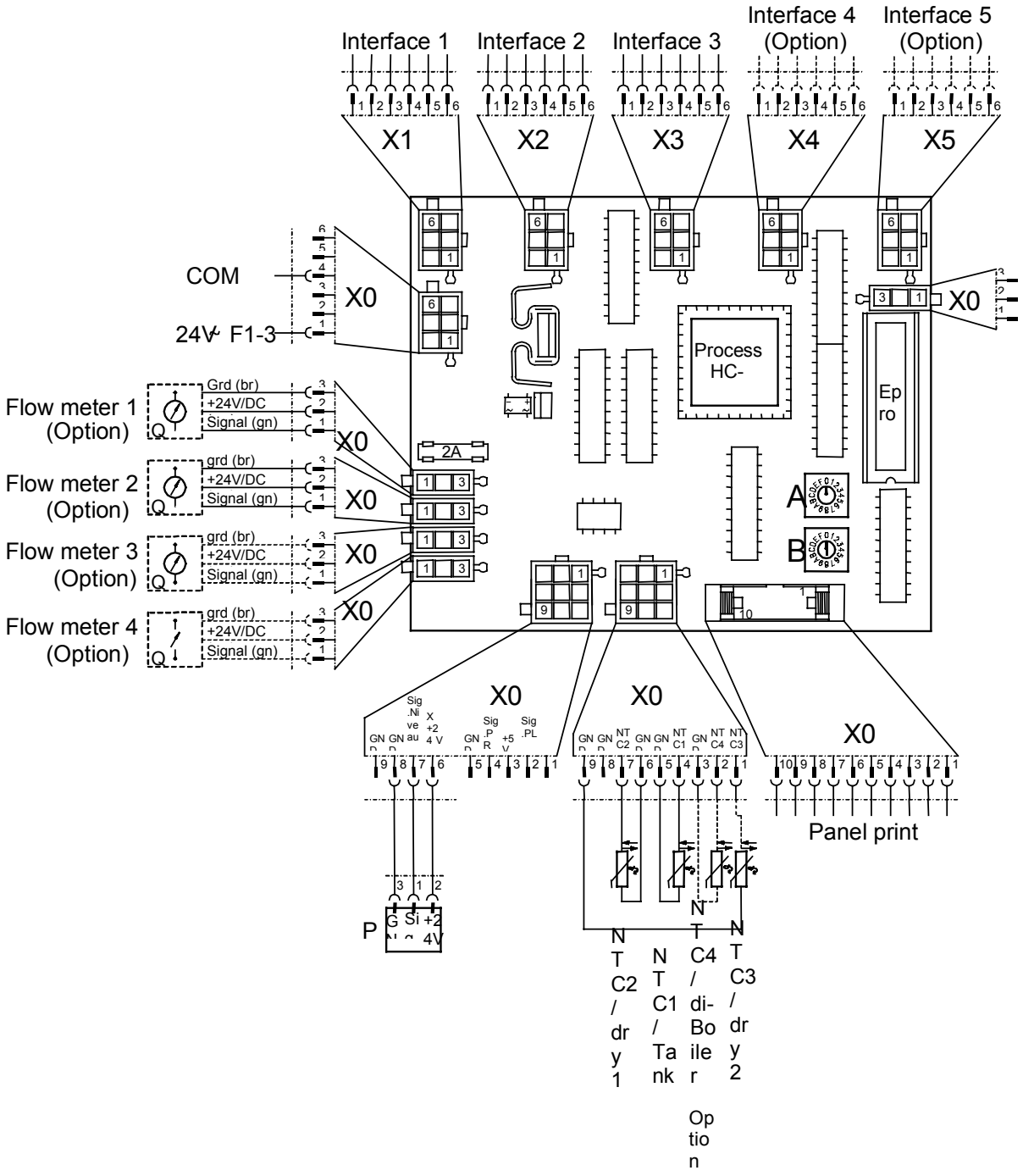
5.7 Wiring Diagram, 208 V / 60 Hz, Door Drive

Pic. 74170-9



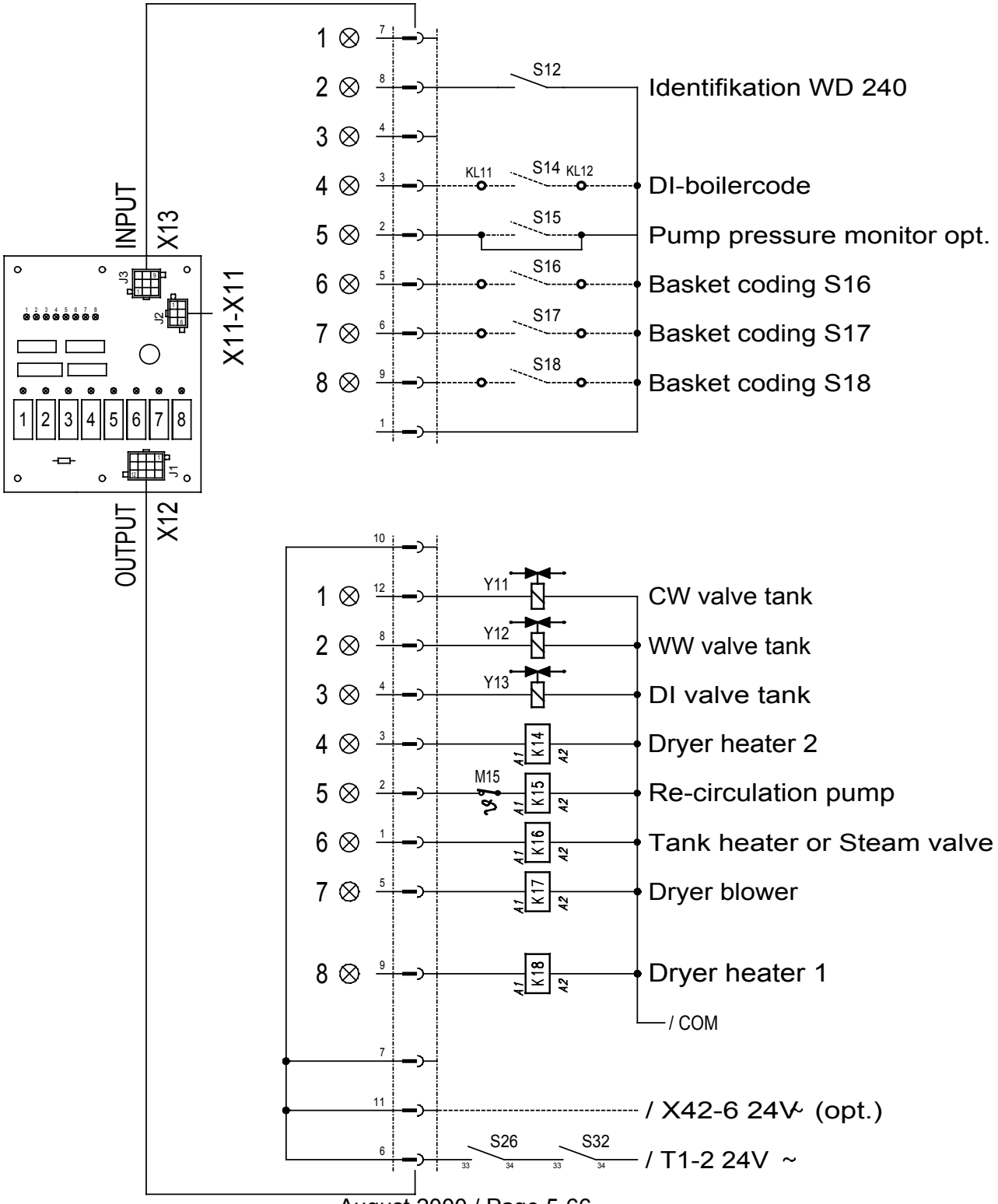
5.8 Processor Print

Pic. 74170-18



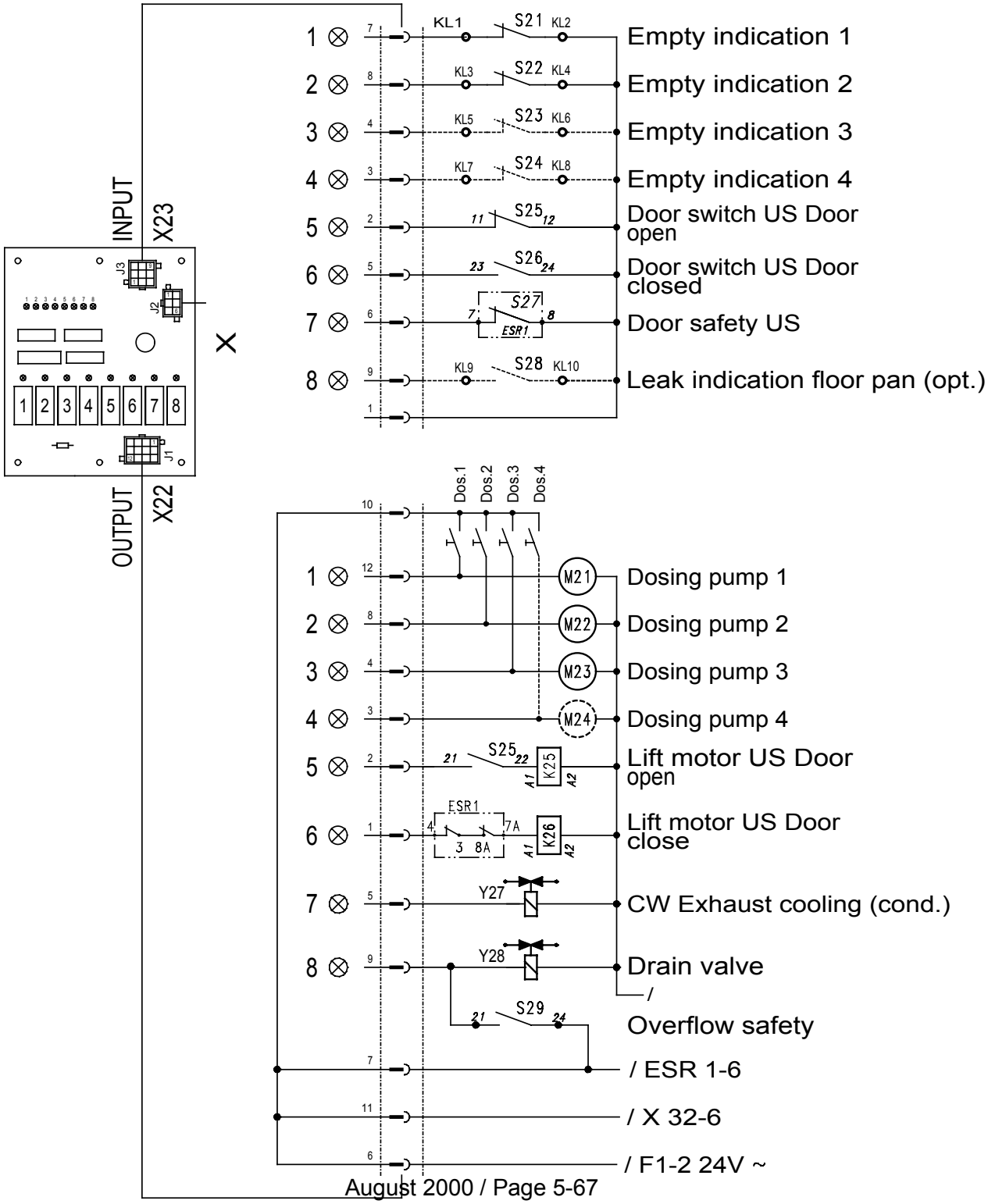
5.9 Interface Print 1

Pic. 74170-13



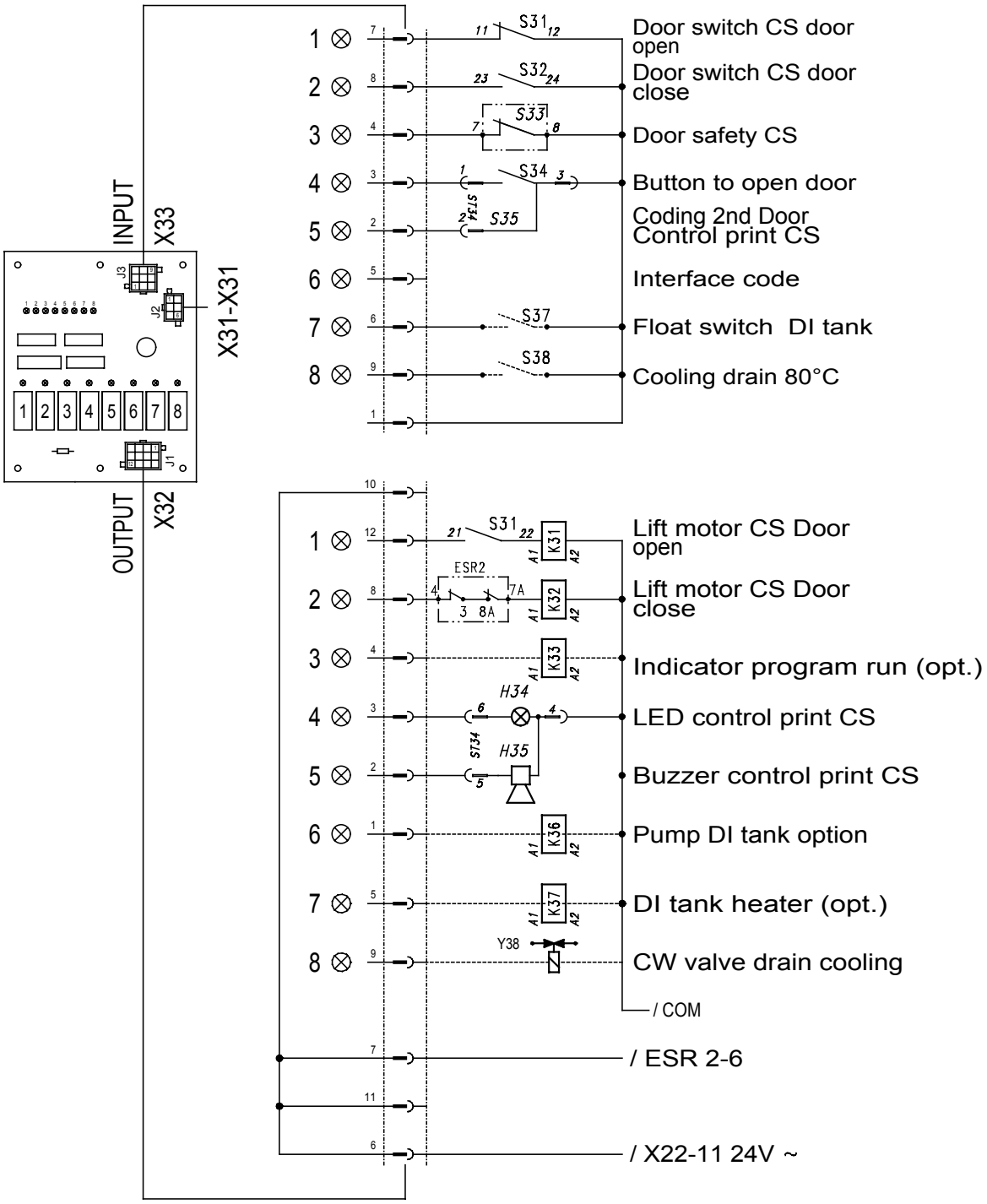
5.10 Interface Print 2

Pic. 74170-14



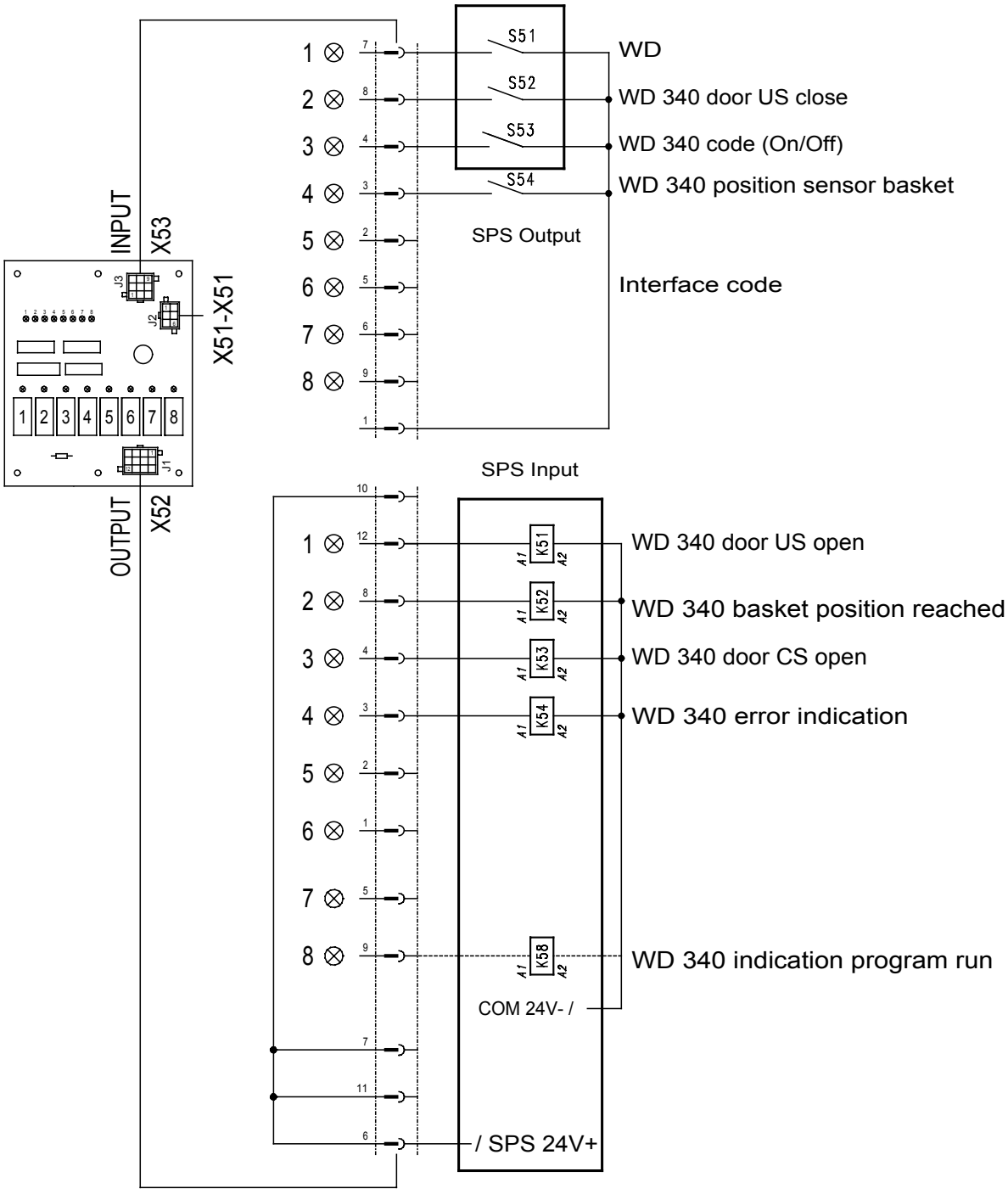
5.11 Interface Print 3

Pic. 74170-15



5.12 Interface Print 5 Automatic Door Drive

Pic. 74170-17



6. Customer Service Center

Maintenance and Service are available from:

SWITZERLAND - BELIMED AG
6275 Ballwil

Telephone: ++41 (0)41 449 78 88
Telefax: ++41 (0)41 449 78 89

UNITED STATES – AVENATECH INC.

14301 SW 119th Ave.

Miami, Florida

Telephone: (305) 252-3338
Fax: (305) 234-1115